Direct-Flo™
Sistemas Gold

Manual de Instruções

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DIRECT-FLO™ GOLD
MANUAL DE INSTRUÇÕES
INTRODUÇÃO E INSTALAÇÃO

HOT RUNNER SYSTEMS

1.0 INTRODUÇÃO À SÉRIE DF GOLD

DESCRIÇÃO:
Os sistemas DF são resultado de 5 décadas de experiência em projeto e construção de sistemas de camara quente. A série DF GOLD é um refinamento do já comprovado conceito DF, e foi introduzido em celebração ao nosso 50 aniversario.

A origem do projeto das buchas esta baseada no "DFQ" (buchas roscadas) e "DFX" (buchas de compressão), que segue o já bem estabelecido principio Direct-Flo™ ("DF"). O material plástico é carregado do bico da maquina injetora até a cavidade através do caminho mais direto possível, minimizando com isso o stress e a pressão de injeção.

Seis séries de buchas estão disponíveis com comprimentos de até 600 mm, acomodando desde pequenos até grandes volumes de injeção. Cada série de bucha tem 14 ponteiras padrão, incluindo valvulados hidráulicos e pneumáticos para melhor qualidade do ponto de injeção.

AS CARACTERÍSTICAS DF GOLD INCLUEM:

Twin Heater
A Resistencia incorpora 2 circuitos separados de aquecimento em cada Resistencia de bico. Esta redundância previne a parada de maquina no caso de um dos circuitos queimar, e permite a fácil substituição da resistência durante um período planejado de manutenção.

Configurações de Ponteira Melhoradas
Varios tipos de ponteira foram adicionados para aumentar a flexibilidade das aplicações. Todos os diretores de fluxo utilizam uma cobertura para aumentar a resistência ao desgaste.

Color Seal
Caso o processo de troca de cor padrão falhar e não remove todo o material presente no sistema previamente, o "Color Seal" elimina a possibilidade de o material criar residência na região da ponteira.

Manifolds
Nossos manifolds são construidos com aço de alta Qualidade e materiais especiais com propriedades que oferecem alta resistecia ao desgaste e canais brunidos para assegurar um fluxo de resina ótimo e sem interrupções. Manifolds angulares também estão disponíveis para aplicações especiais, como injeção de 2 materiais.

Para aplicações com manifolds, nosso projeto do sistema é parte deste manual de instruções.

OUTRAS NOTAS:
Favor encaminhar este manual para o usuário final do sistema.

A garantia é valida somente se a instalação e operaração ocorrerem de acordo com nossas instruções.

Verificações importantes antes do primeiro teste:
– Alojamento da ponteira
– Diametro do Gate
– Area de contato da ponteira
– Expansão da bucha quente
– Conexão eletrica

Em caso de dúvida, favor ligar para nosso departamento de aplicações.

Nossos produtos são apenas parte do processo de produção. Outros componentes como matéria-prima, molde ou maquina injetora tem um efeito significativo no funcionamento dos nossos produtos.

A Garantia é oferecida somente dentro das condições descritas no nosso termo de condições de venda e entrega.

Possivel de alteração.

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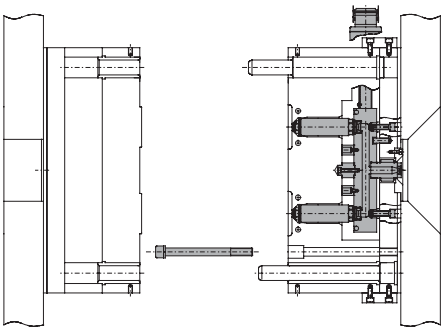
1.1 SISTEMAS INTEGRADOS

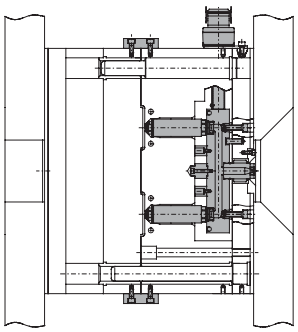
1 Preparação para manutenção na máquina

- Abrir o molde e retirar os parafusos.



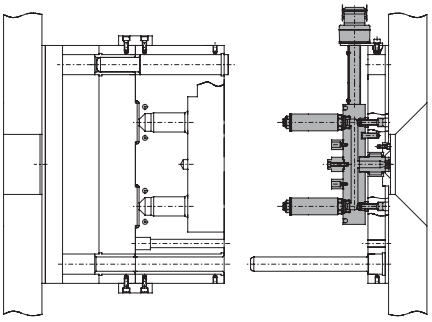
2 Preparação para manutenção na máquina

- Fechar o molde e trava placa porta macho com placa cavidade.



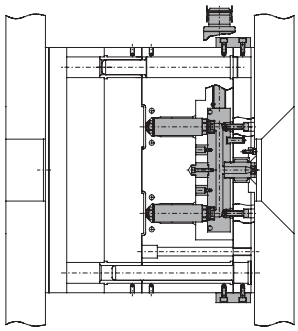
3 Pronto para manutenção na máquina

- Abrir molde para manutenção do sistema.
- Troca da Ponta.
- Troca do diretor de fluxo.
- Troca do termopar do bico.
- Troca do termopar do Manifold
- Inspeção elétrica e vazamentos.



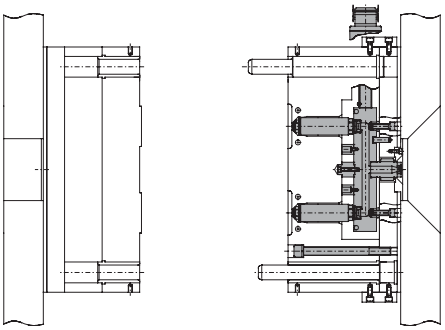
4 Preparação para produção

- Fechar o molde e travar a placa cavidade com placa superior.



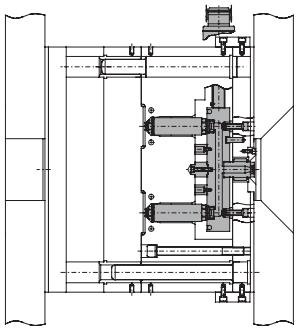
5 Preparação para produção

- Abrir o molde e instalar os parafusos.



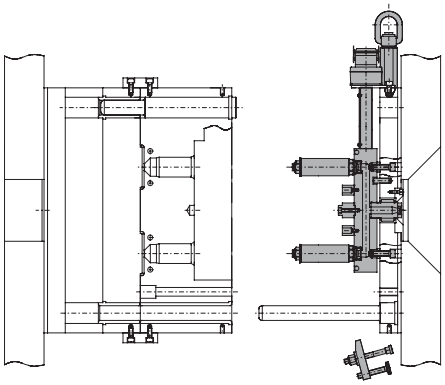
6 Produção

- Molde pronto para produção.



7 Preparação para manutenção na bancada

- Retirar parafusos da placa superior.
- Remover placa superior com sistema da máquina.



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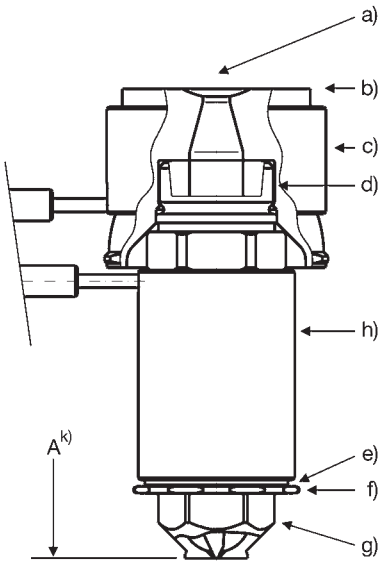
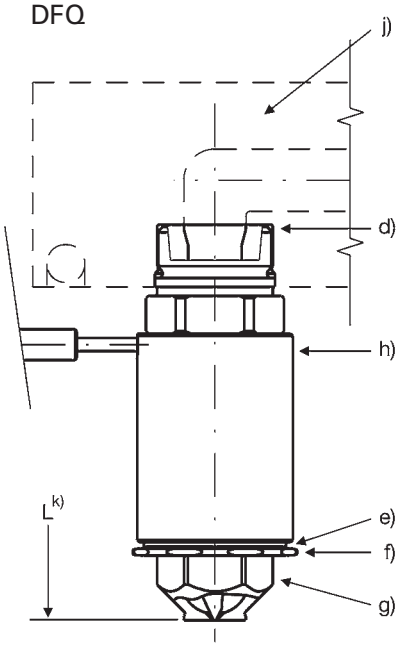
1.2 MONTAGEM DE BUCHAS

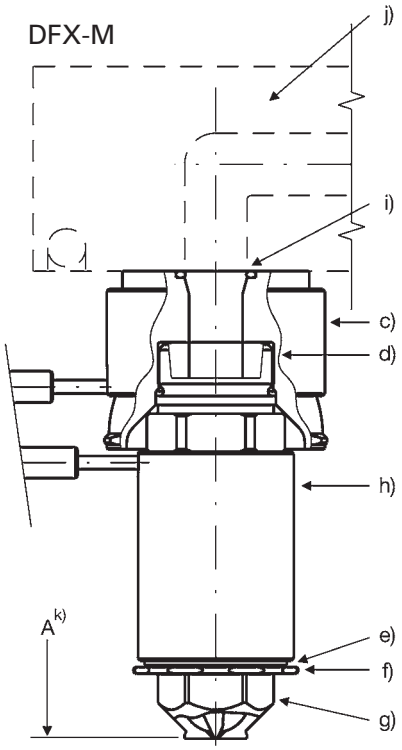
DFX-R



DFQ



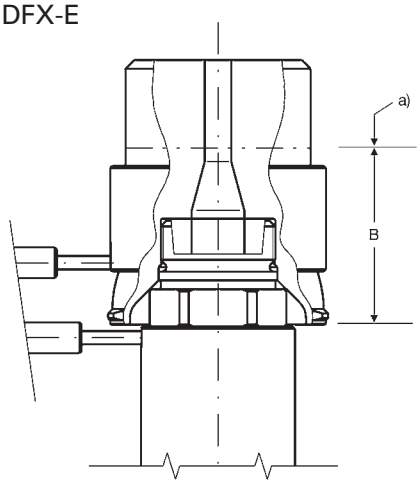
DFX-M

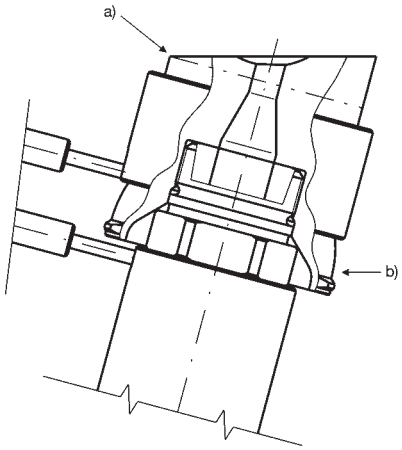


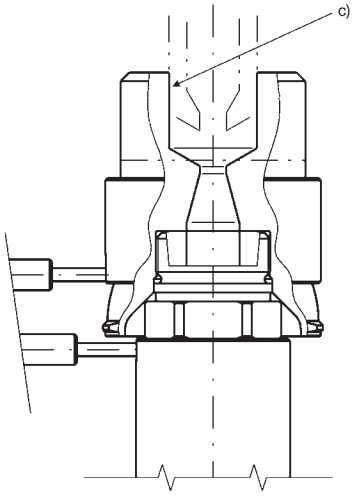
FAVOR OBSERVAR

a) Profundidade max. p/ R = 2mm
b) O anel de isolação deve sempre existir.
c) Resistencia com controle independente.
d) Não remova.
e) Isolante entre resistência e anel de centragem.
f) O anel de centragem deve existir sempre.
g) Veja “pontas”
h) Veja “Resistencias de buchas”
i) Troque o anel sempre que desmontar.
j) Veja desenho do sistema.
k) Dimensões do molde devem incluir expansão.

DFX-E







FAVOR OBSERVAR

a) Nunca reduza dim. B.
b) Usar pino para travamento.
c) Use ajuste H7/g6.

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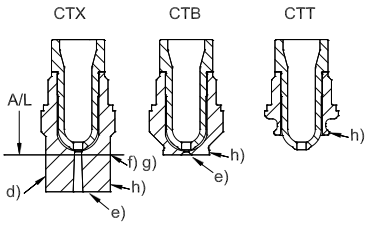
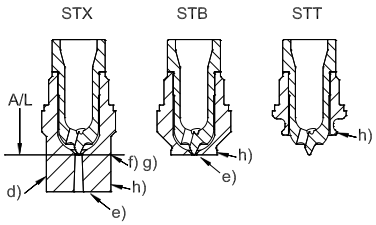
1.3 MONTAGEM DAS PONTAS

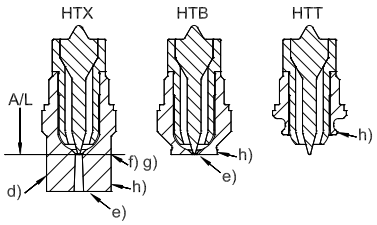
CT a) b) c)



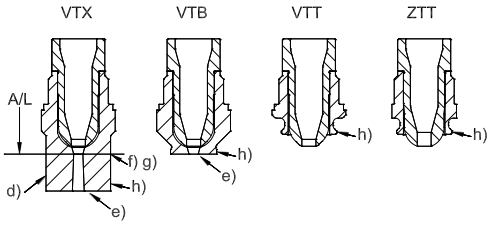
ST a) b) c)



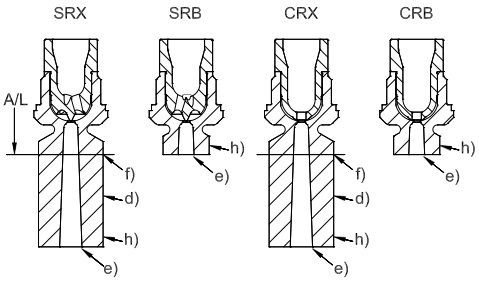
HT a) b) c)



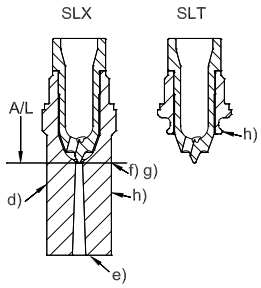
VT a) b)



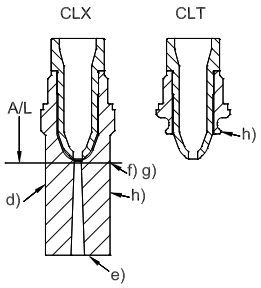
SR/CR a) b) c)



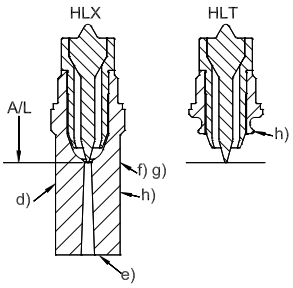
SL a) b) c)



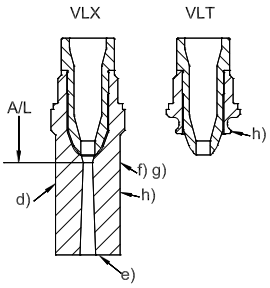
CL a) b) c)



HL a) b) c)



VL a) b) c)



FAVOR OBSERVAR

a) Usar anti-engripante nas roscas, mas manter a ponta limpa.
b) Ver “Torque a Aplicar”
c) Ponto de injeção conf. solicitado ou conforme desenho Incoe
d) Contato da ponta conf. solicitado ou conf. desenho Incoe
e) Face da ponta não pode tocar o molde após expansão.
f) Não reduza a dimensão A/L.
g) Alivio sob. solicitação
h) Ajuste H7/j6.

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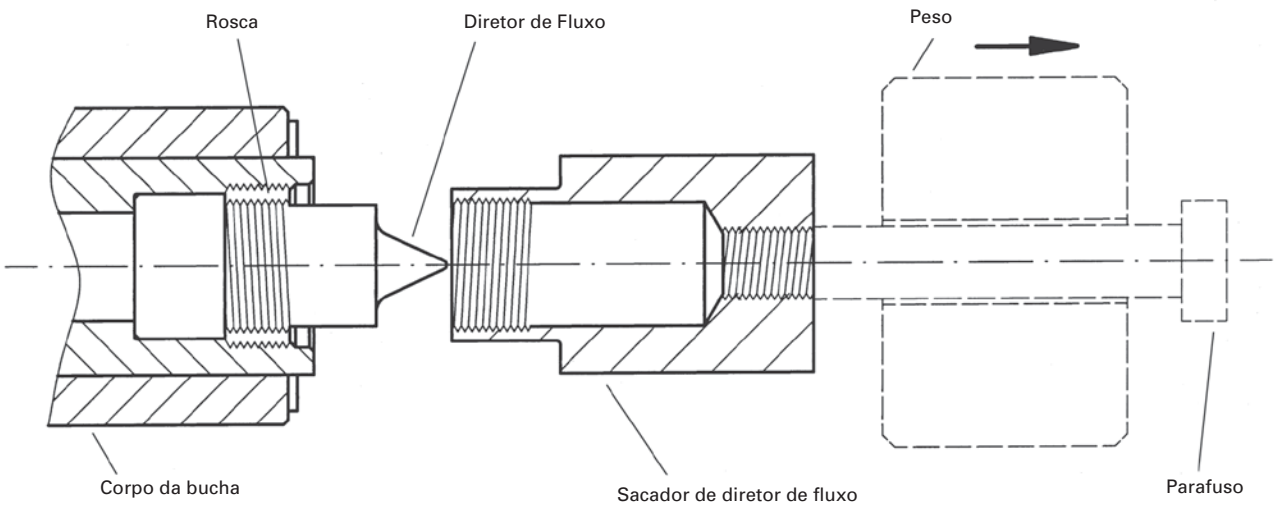
1.4 SACADOR DE DIRETOR DE FLUXO



OBSERVARS

O sacador de diretor de fluxo pode-se encomendar na INCOE®.

Em Primeiro lugar o Plástico no diretor de fluxo deve ser aquecido até 150°C.

Montar sacador no diretor de fluxo e sacar o diretor.

Antes de montar o novo diretor de fluxo é necessário limpar o alojamento do corpo.

Antes de montar a ponta, ler o capítulo "montagem das pontas".

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1.5 TORQUES A APLICAR

Corpos da bucha

SÉRIE	NM
DF 3	30
DF 5	50
DF 8	110
DF 12	200
DF 18	250
DF 25	300

Montagens das cabeças DFX somente INCOE®.

Pontas

SÉRIE	NM
DF 3	6
DF 5	8
DF 8	35
DF 12	80
DF 18	120
DF 25	250

ATENÇÃO!

Depois do torque a frio, as pontas devem sofrer reaperto a 250°C (482°F).

Para soltar ponteiras, aquecer até aprox. 250°C (482°F)

Lb-Ft = Nm x 0.72
250˚C = 482˚F

Use sempre graxa para alta temperatura nas roscas.

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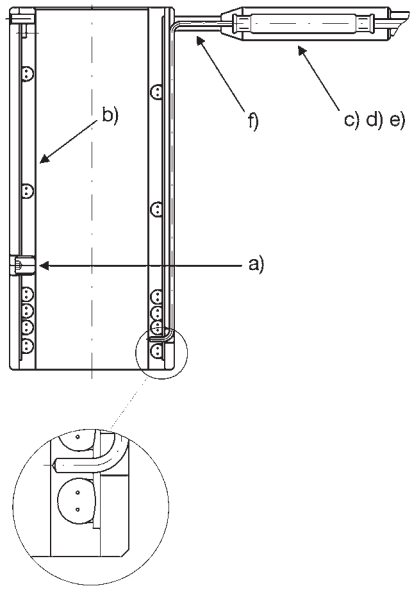
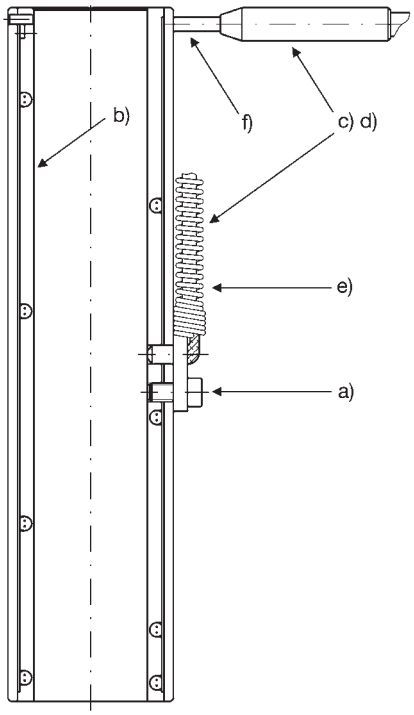
1.6 RESISTÊNCIAS DE BUCHA

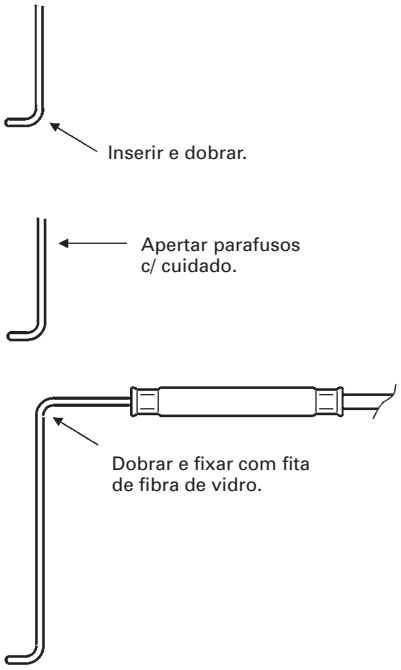
BH g)



MH g)



BH Troca do TC



FAVOR OBSERVAR

a) Afrouxar antes de desmontar, apertar após montagem.
b) Usar desengripante. Se necessário aquecer para soltar.
c) Verifique as partes elétricas antes de montar.
d) Proteja os cabos contra superaqueciemento.
e) Usar somente cabo Fe-CuNi para extender termopares.
f) Dobra somente sob encomenda.
g) Não ligue termopares ou resistências em paralelo.

TENSÃO

Tensão: 230 Volt
Termopar Fe-CuNi
Padrão ASA Tipo J
Código de cor:
branco = + (magnético)
vermelho = –

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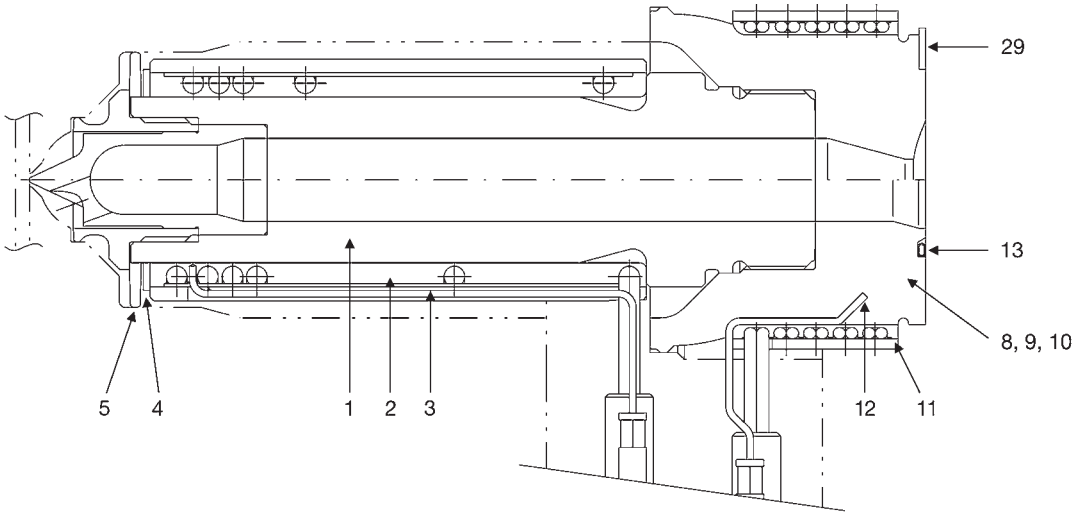
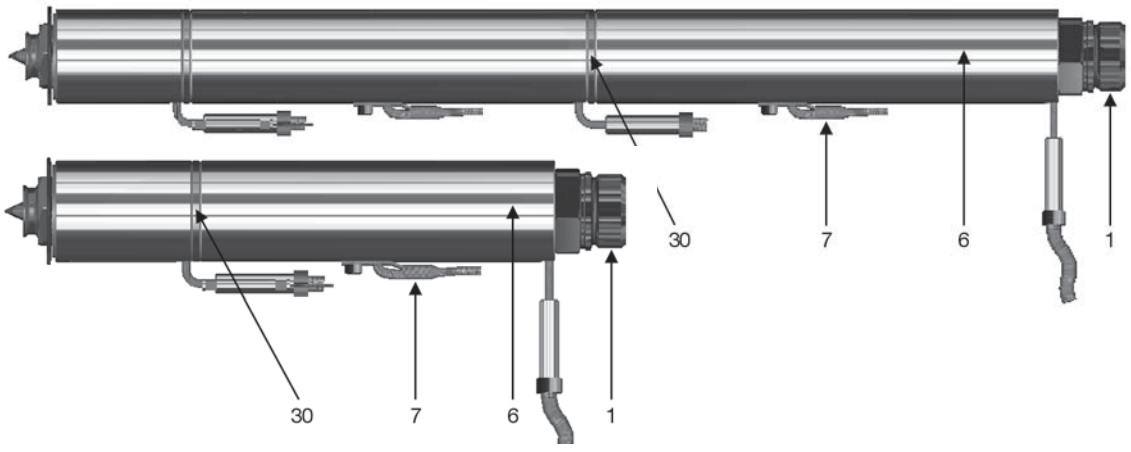
1.7 LISTA DAS PEÇAS DE BUCHAS



Pos.		Descrição						
1	DS	Corpo da bucha	6	MH	Resistência Multi Zona	11	H	Resistência da Cabeça
2	BH	Resistência de Base	7	MTC	Termopar Multi Zona	12	TC	Termopar da Cabeça
3	BTC	Termopar de Base	8	R	Cabeça com raio	13		O-Ring
4	IR	Isolante	9	M	Cabeça com anel	29	IR	Isolante da Cabeça
5	CR	Anel de Centragem	10	E	Cabeça com sobremetal.	30	SP	Espaçador

DF-MZ



PEDIDO

Favor especificar: Pos., Descrição, Pedido: No. Código da bucha, No. Do Sistema

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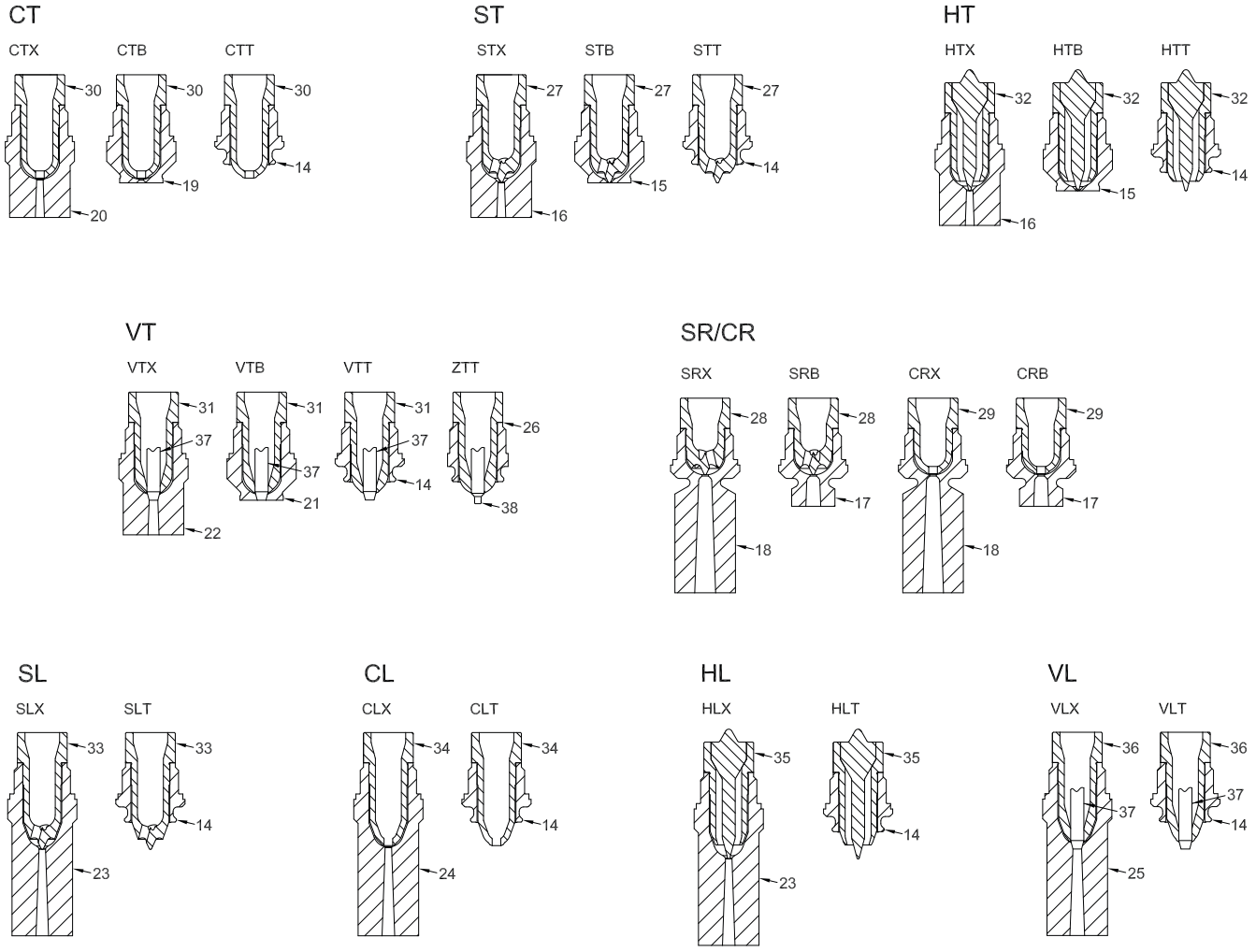
1.8 LISTA DE PEÇAS DE PONTAS



Pos.	Descrição	
14	TCap	Bico sem Ponta
15	STB/HTB	Ponta Padrão
16	STX/HTX	Ponta com Sobremetal
17	SRB/CRB	Ponta Padrão
18	SFX	Ponta com Sobremetal
19	CTB	Ponta Padrão
20	CTX	Ponta com Sobremetal
21	VTB	Ponta Padrão
22	VTX	Ponta com Sobremetal
23	SLX/HLX	Ponta com Sobremetal
24	CLX	Ponta com Sobremetal
25	VLX	Ponta com Sobremetal
26	ZTT	Bico sem Ponta/Montagem do diretor de fluxo
27	ST	Tip
28	SR	Tip
29	CR	Tip
30	CT	Tip
31	VT	Tip
32	HT	Tip
33	SL	Tip
34	CL	Tip
35	HL	Tip
36	VL	Tip
37	VP	Pino Valvulado
38	VPZ	Agulha do valvulado cilíndrica

PEDIDO

Favor especificar: Pos., Descrição, Pedido: No. Código da bucha, No. Do Sistema

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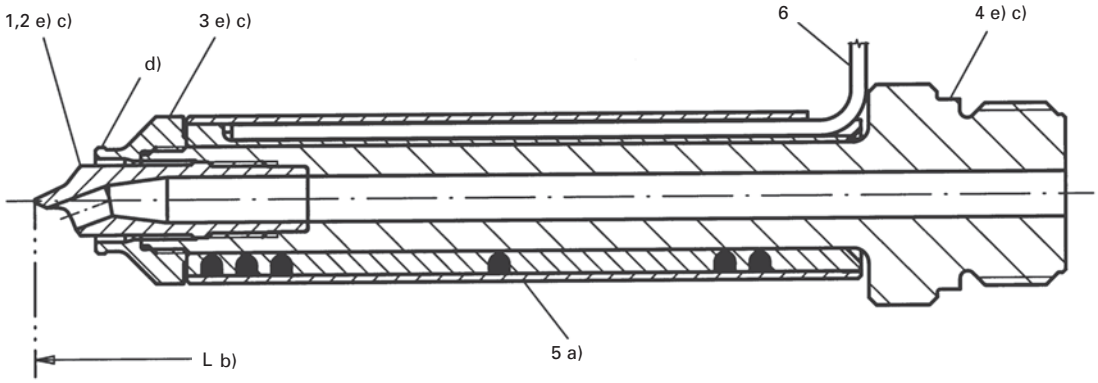
1.9 DF 3: MONTAGEM E LISTA DE PEÇAS



Lista de Peças

1. Diretor de Fluxo DT 3 ST
2. Diretor de Fluxo DT 3 CT
3. Ponta DC 3 T
4. Corpo da bucha DS 3
5. Resistência BH
6. Termopar BTC

IMPORTANTE

a) Controlar por separado.

b) A dimensão do molde deve incluir a dilatação.

c) Usar desingripante nas roscas.

d) Ajuste deve ser H7/j6.

e) Torques a aplicar

– Diretor de Fluxo 4 Nm

– Ponta 6 Nm

– Corpo da bucha 30 Nm

Lb-Ft = Nm x 0.72

Montar de acordo com nosso desenho no sistema.

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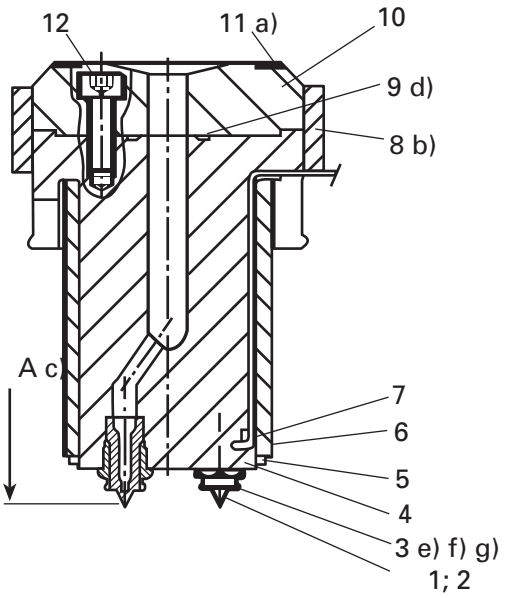
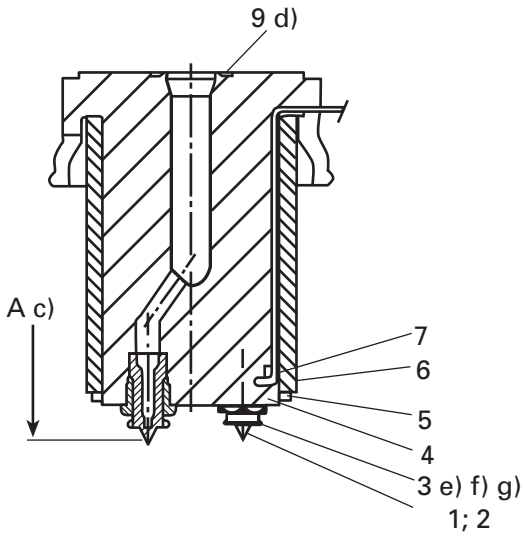
1.10 DMT MULTI-TIP: LISTA DE PEÇAS

DMT-R



DMT-M



Lista de Peças

1. Bico DT 5 ST
2. Bico DT 5 C
3. Ponta DC 5 T
4. Corpo da Bucha DMT
5. Anel Elástico SPA 38
6. Resistência H38060/070/080
7. Termopar BTC 1-60/1-70/1-80
8. Resistência de cinta HBTJ 5818
9. O-Ring 610
10. Disco DMT-R
11. Isolante DH 18
12. Parafuso M5x16

IMPORTANTE

a) Anel isolante deve ser sempre instalado.
b) Controlar separadamente
c) Dimensões no molde devem incluir expansão.
d) Trocar sempre após desmontagem
e) Utilizar graxa Anti-engripante na rosca.
f) Torque 8 Nm.
g) Ajuste deve ser H7/j6.

Montar de acordo com nosso desenho do sistema.

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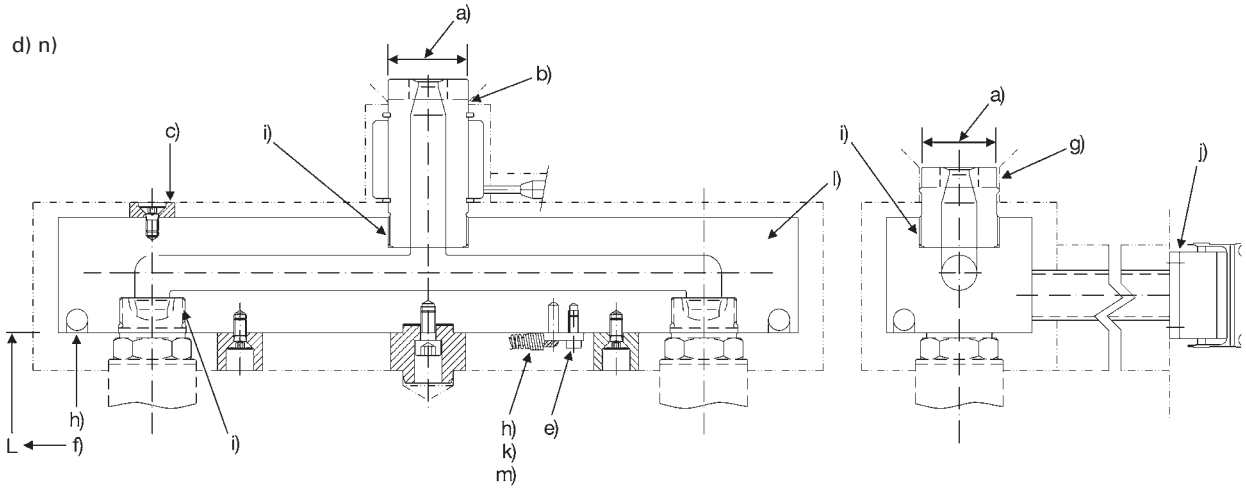
1.11 DFQ/DFS MONTAGEM DE MANIFOLD



OBSERVARS

a) Deve ajustar e vedar
b) Contato máximo 0,6mm
c) Folha p/ expansão conf. desenho do sistema.
d) Usar desengripante nas roscas.
e) Apertar.
f) Dimensões do molde devem incluir expansão.
g) Somente para PP,PEePS.
h) Proteger os fios do calor.
i) Consulte a INCOE® antes de remover
j) Ligado e inspecionado conforme especificação do cliente.
k) Fe-CuNi, branco = + / verm. = –
l) Antes de montar, aquecer o manifold aprox. a 100°C.
m) Emendas somente com cabos Fe-CuNi.
n) Antes de montar verificar todas as zonas individualmente a 100°C aprox.

FAVOR OBSERVAR

Verifique o desenho do sistema para montage. Caso haja alguma questão, favor entrar em contato com nosso departamento de aplicações.

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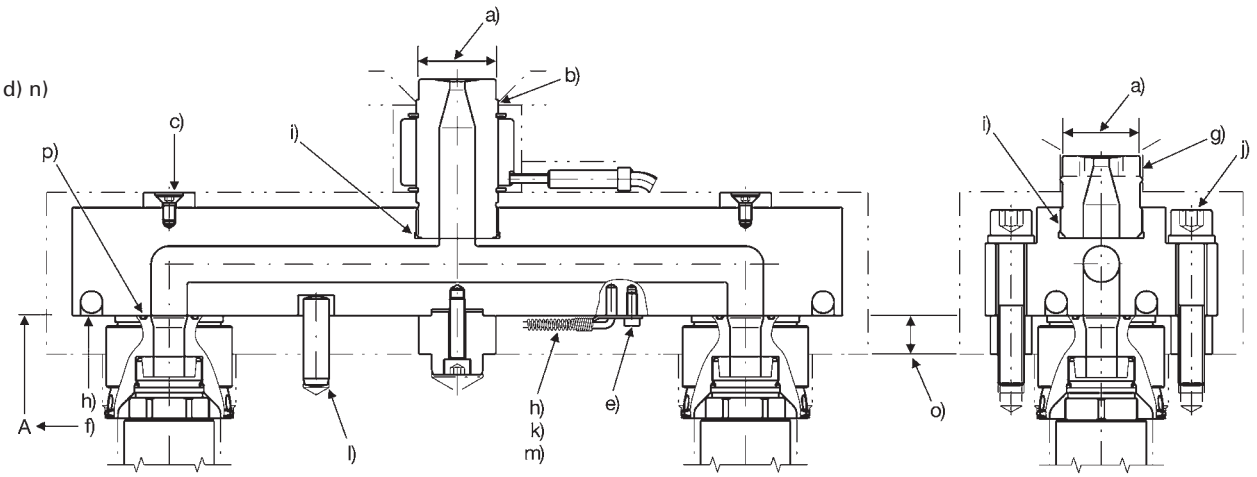
1.12 DFX MANIFOLD: MONTAGEM



OBSERVARS

a) Deve ajustar e vedar.
b) Contato máximo 0,6mm.
c) Folga para expansão conf. desenho do sistema.
d) Usar graxa anti-engripante em todas as roscas.
e) Apertar.
f) Dimensões do molde devem incluir expansão.
g) Somente para PP,PE,PS.
h) Proteger todos os fios do calor.
i) Consulte INCOE® antes de remover.
j) Torques
   M6=14 Nm
   M8=35 Nm
   M10=70 Nm
   M12=129 Nm
k) Fe-CuNi branco = + / vermelho = –
l) Pino centrador.
m) Emendas somente com fios de Fe-CuNi.
n) Antes de montar, verificar todas as zonas individualmente a 100°C aprox.
o) Tolerância entre bicos e suportes deve ser de 0,02mm.
p) Não deve haver marcas ou danos nas áreas de vedação.

FAVOR OBSERVAR

O desenho do sistema apresenta a montagem. Em caso de dúvida, favor contatar o departamento de aplicações ou engenharia.

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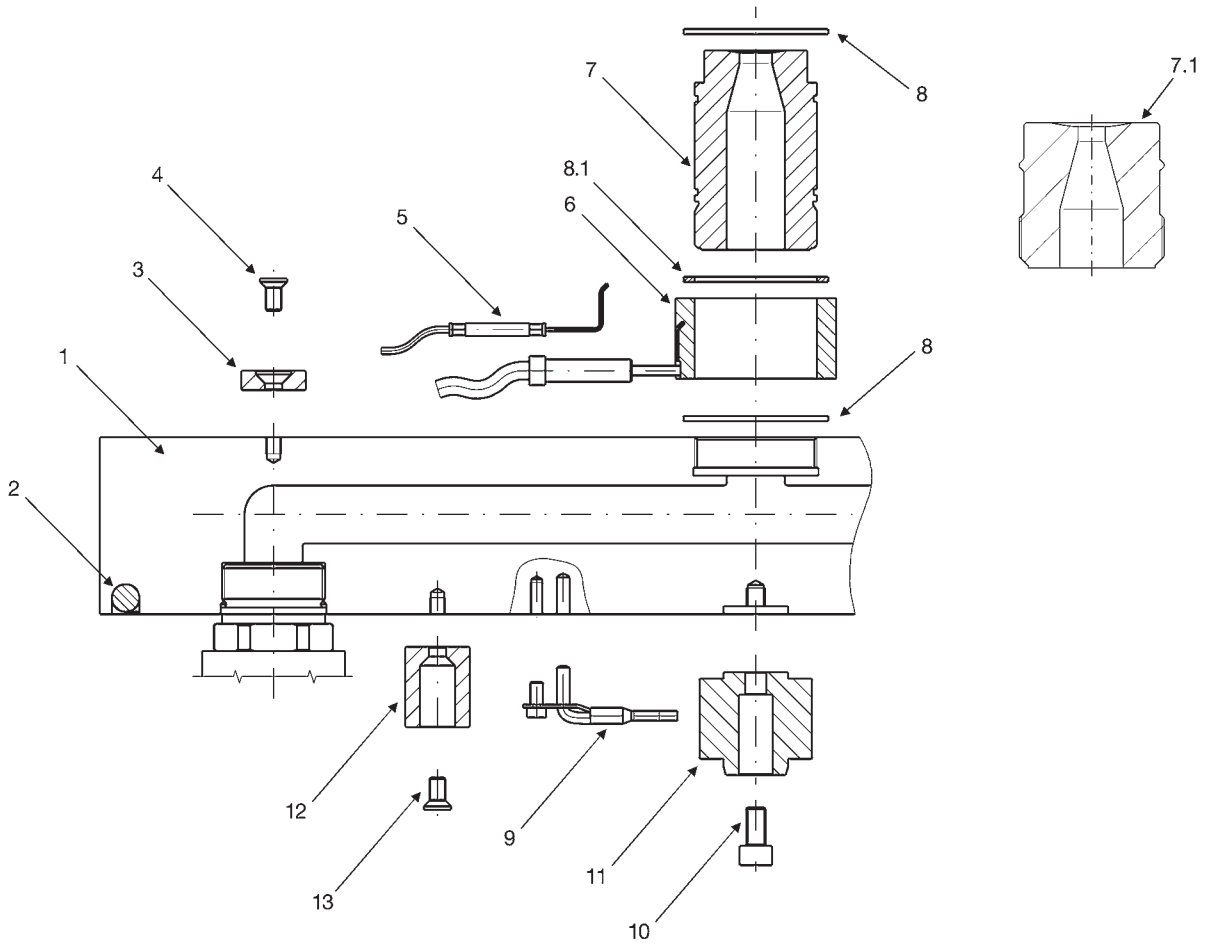
1.13 DFQ MANIFOLD: LISTA DE PEÇAS



Pos.		Description
1	MNQ	Manifold
2	RHK	Resistência Tubular
3	DSTO	Suporte Superior
4	M	Parafuso
5	BTC	Termopar AB
6	BH	Resistência AB
7	DN	Bucha Extensora Aquecida
7.1	DN	Bucha Extensora Fixa
8	SR	Anel Centrador
8.1	IR	Anel Isolante
9	ISI-412	Termopar do bloco
10	M	Parafuso
11	DSTM	Suporte Central
12	DSTU	Suporte Inferior
13	M	Parafuso

PEDIDO
Favor especificar: Pos., Descrição, Número do Sistema.

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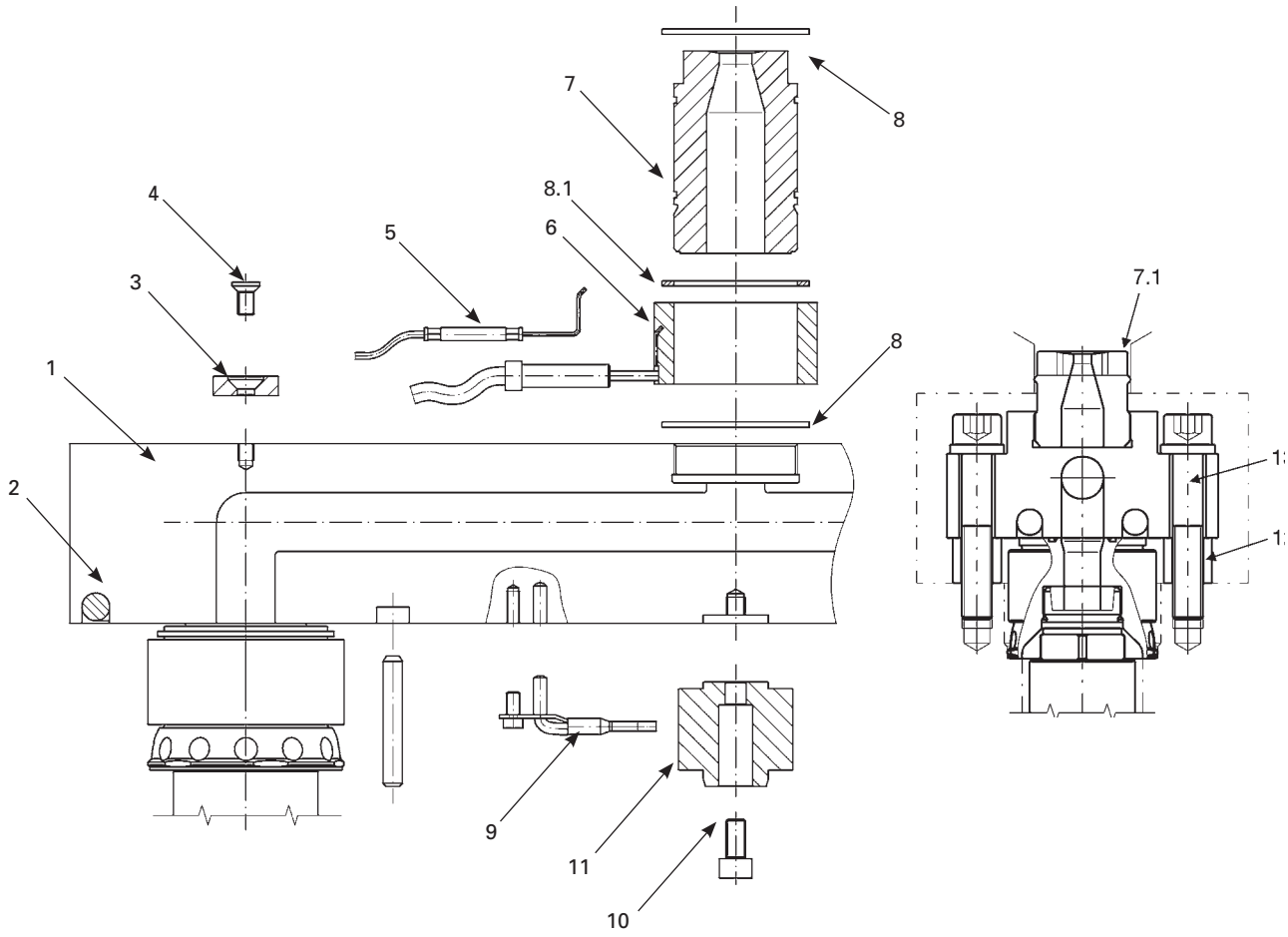
1.14 DFX MANIFOLD: LISTA DE PEÇAS



Pos.		Descrição
1	MNX	Manifold
2	RHK	Resistência Tubular
3	DSTO	Suporte Superior
4	M	Parafuso
5	BTC	Termopar AB
6	BH	Resistência AB
7	DN	Bucha Extensora Aquecida
7.1	DN	Bucha Extensora sem aquecimento
8	SR	Anel centrador
8.1	IR	Isolante
9	ISI-412	Termopar do Manifold
10	M	Parafuso
11	DSTM	Suporte Central
12	DSTU	Suporte Inferior
13	M	Parafuso
14		O-Ring
15	SZ	Localização Lateral

PEDIDO

Favor especificar:
Pos., Descrição, Número do Sistema.

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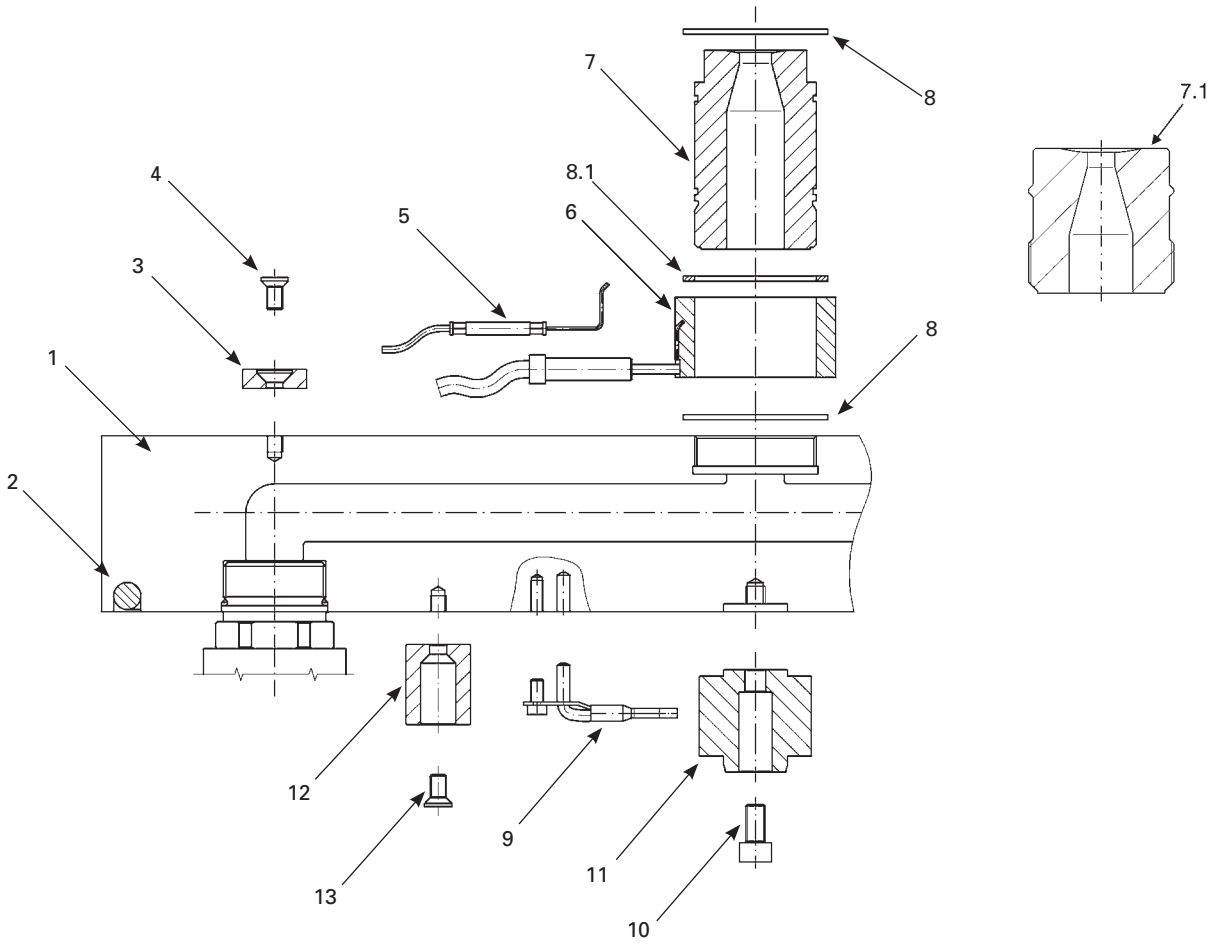
1.15 DFS MANIFOLD: LISTA DE PEÇAS



Pos.		Descrição
1	MNQ	Manifold
2	RHK	Resistência Tubular
3	DSTO	Suporte Superior
4	M	Parafuso
5	BTC	Termopar AB
6	BH	Resistência AB
7	DN	Bucha extensora Aquecida
7.1	DN	Bucha extensora sem aquecimento
8	SR	Anel Centrador
8.1	IR	Isolante
9	ISI-412	Termopar do Manifold
10	M	Parafuso
11	DSTM	Suporte Central
12	DSTU	Suporte Inferior
13	M	Parafuso

PEDIDO

Favor especificar:
Pos., Descrição, Número do Sistema.

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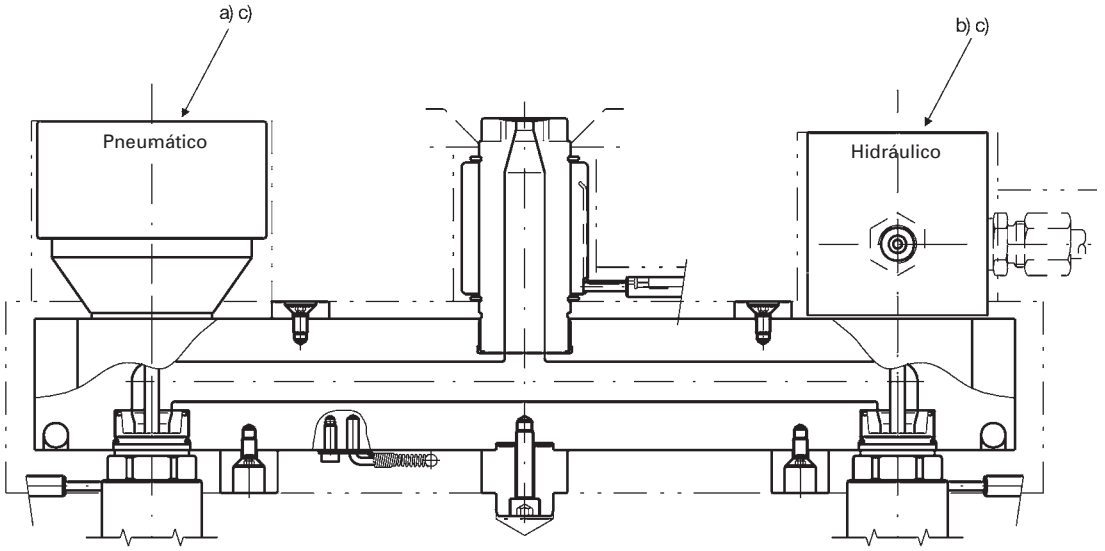
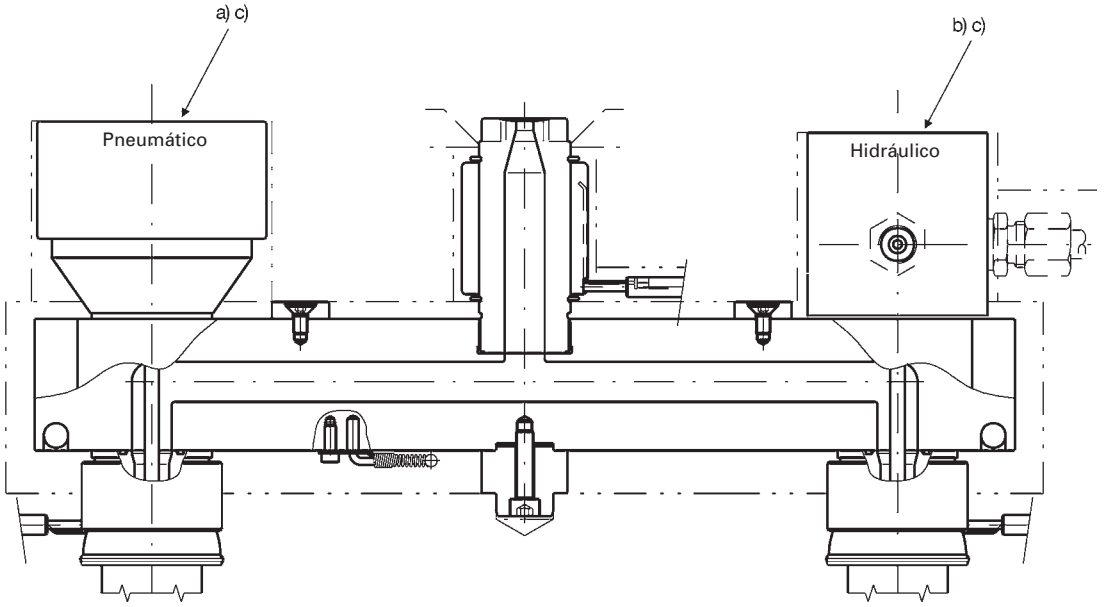
1.16 DFQ/DFX/DFS MONTAGEM SISTEMAS VALVULADOS

d | DFQ



d | DFS

d | DFX



OBSERVARS

a) Pressão máxima 10 bar.

b) Pressãomáxima
DF5 = 8 bar
DF8 = 15 bar
DF12/18 = 40 bar
DF25 = 50 bar

c) Temperatura máxima 50°C.

d) Outra montagem em "Manifold DFQ/DFS" e "Manifold DFX"

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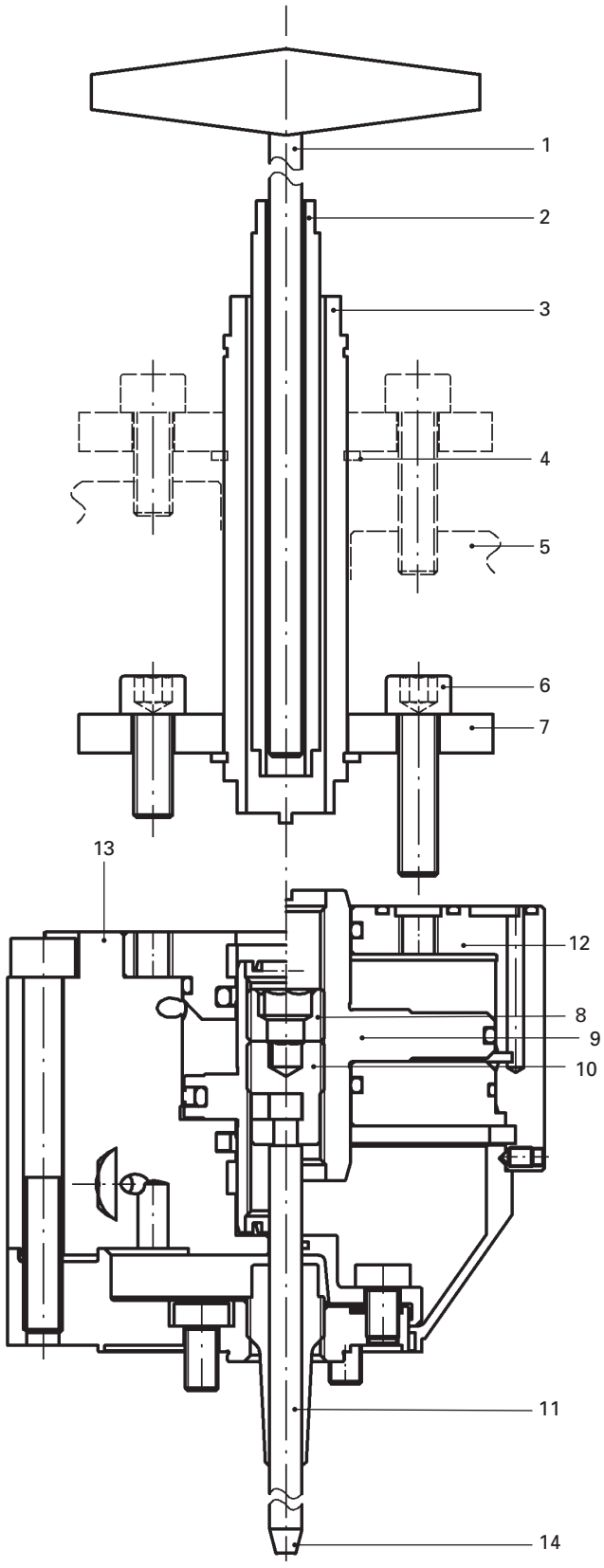
1.17 AJUSTE DOS VALVULADOS



Pos.	Descrição
1	Chave Allen
2	Chave da Trava
3	Trava do pistão
4	Anel Elástico
5	Placa do Molde
6	Parafuso
7	Disco de Fixação
8	Parafuso Trava
9	Pistão
10	Cabeça do Pino
11	Pino Válvula
12	Cilindro Pneumático
13	Cilindro Hidráulico
14	Gate

OBSERVARS

Regulagem
Use 3, 7 e 6 para travar 9. Parafuso em 11 com 10 e 1 para travar 14.

Travamento
Parafuso em 8 com 2, segure 10 com 1 e trave.

PEDIDO

Favor Especificar:
Pos., Descrição, Número do Sistema.

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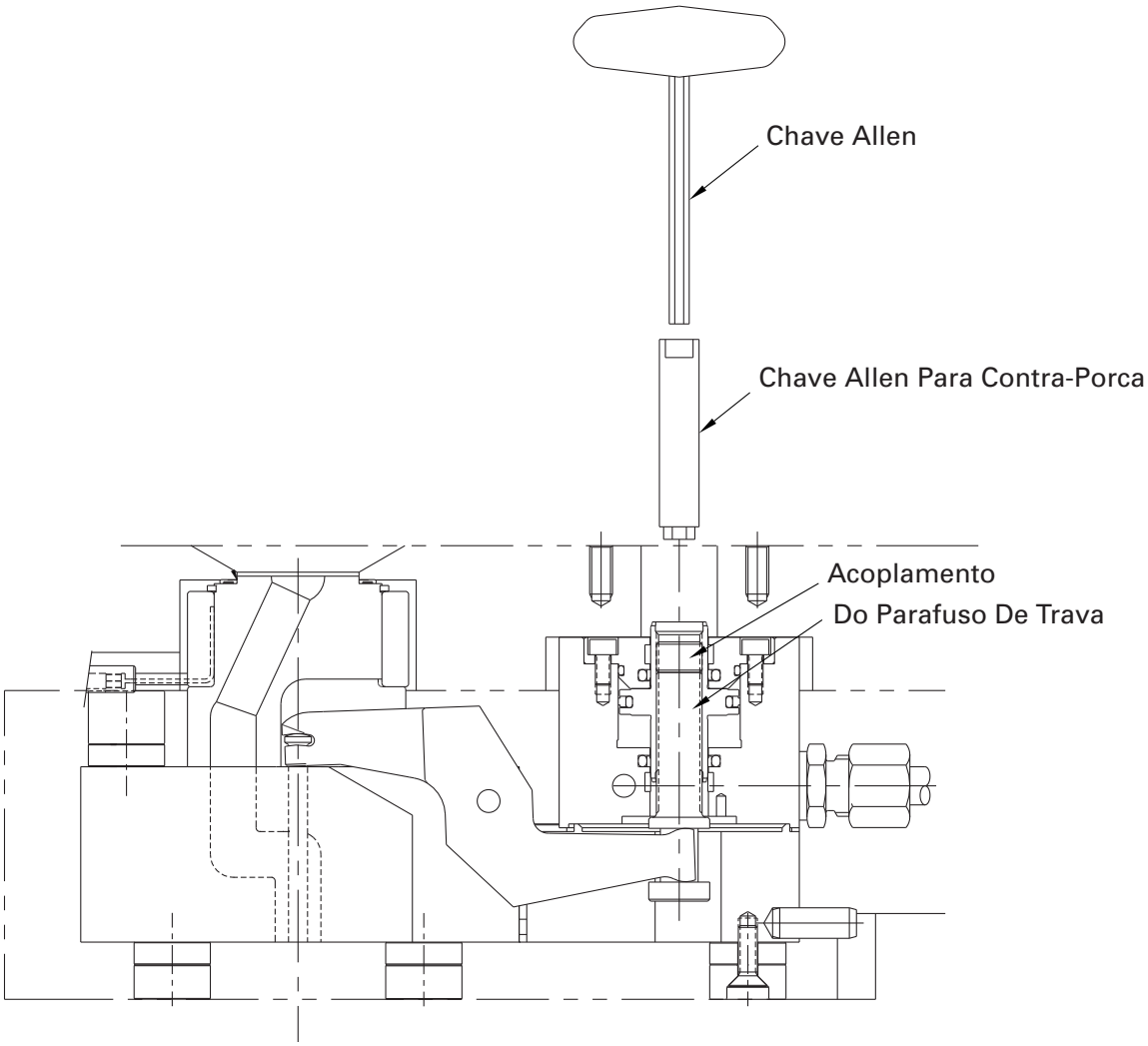
1.18 DSV AJUSTE DO PINO



REGULAGEM

1) Ligue a refrigeração do molde e do DSV
2) Aqueça o DSV e o bico na temperature de trabalho
3) Posicione o pistão na posição “top” (pino fechado) e mantenha a pressão para prevenir a rotação do pistão
4) Use a chave allen para ajustar o parafuso de acoplamento (pino na posição fechada)
5) Segure a chave allen na posição e use a chave da contra-porca para apertar a contra-porca.
6) Desligue o aquecimento do DSV e do Bico
7) Continue a refrigerar o molde e o DSV por pelo menos 15 minutos.

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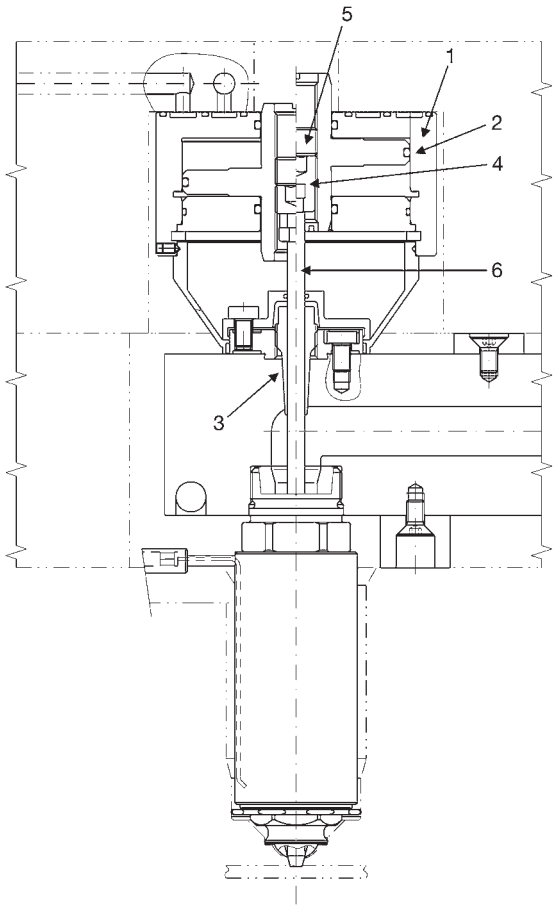
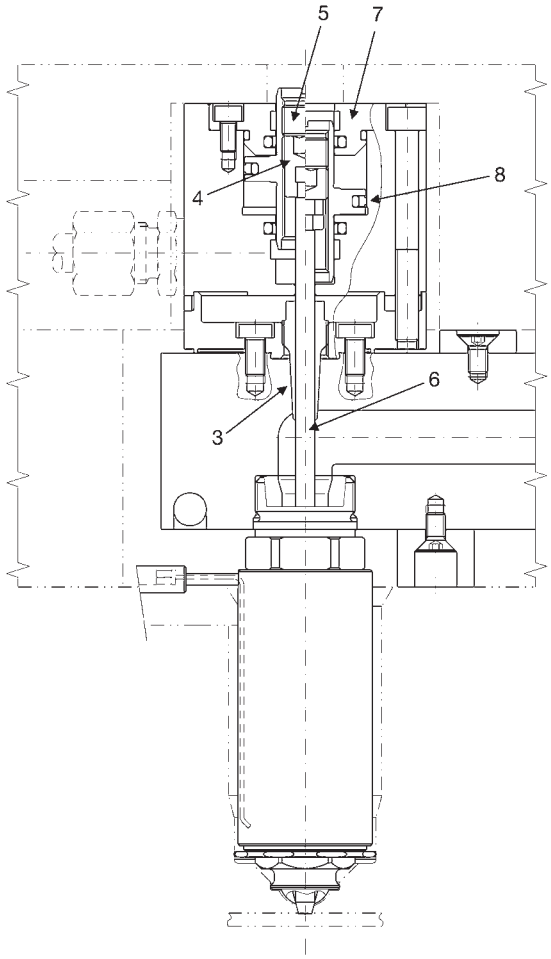
1.19 DFQ/DFX/DFS VALVULADO MULTI-PIN: LISTA DE PEÇAS

PNEUMÁTICO



HIDRÁULICO



Pos.		Descrição
1	PE	Unidade Pneumática
2	PDS	Kit de vedações Pneumáticas
3	DE	Vedação do Pino
4	VK	Cabeça do Pino
5	KS	Parafuso Trava
6	VP	Pino Válvula
7	HE	Unidade Hidráulica
8	HDS	Kit de vedações Hidráulicas

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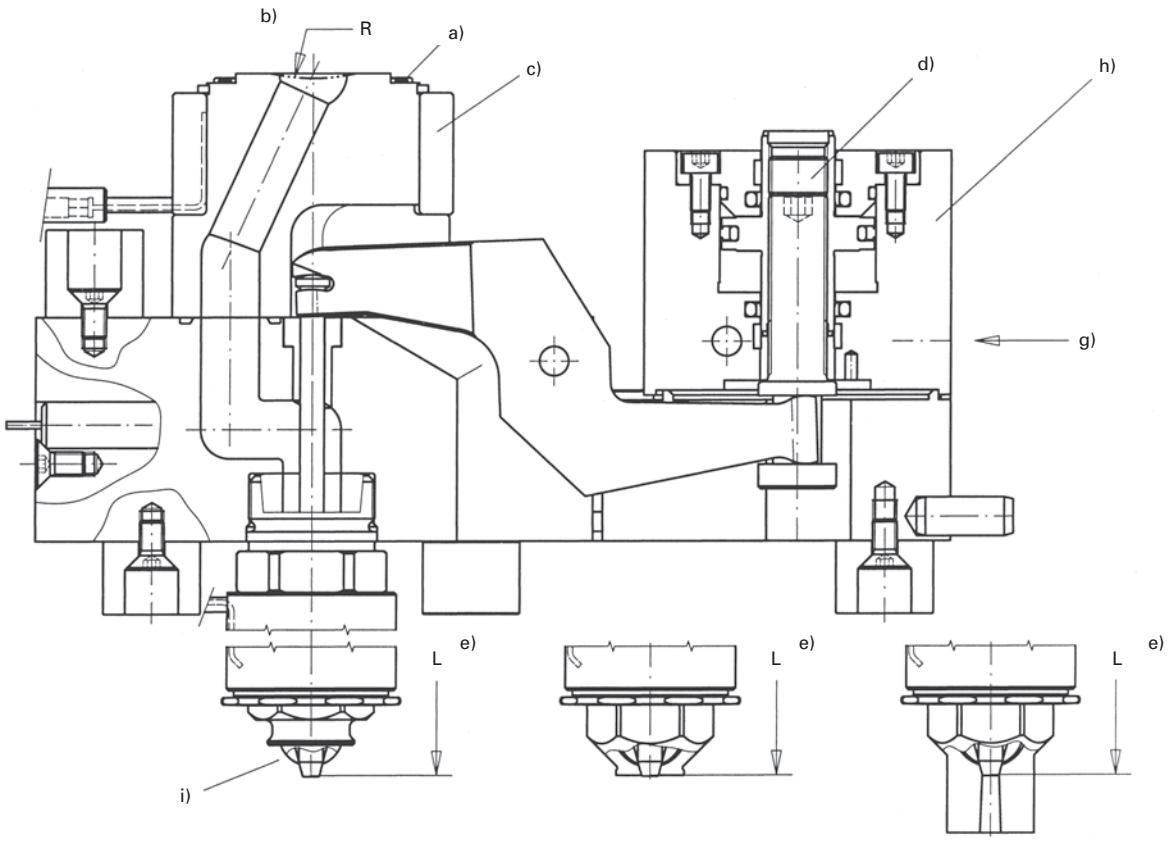
1.20 MONTAGEM DE BUCHAS VALVULADAS



OBSERVARS

a) O Anel isolante deve ser sempre montado.
b) Prof. max. de R = 2mm.
c) Controlar a resistência em separado.
d) Contra porca deve estar apertada (Utilize a ferramenta da INCOE®).
e) As dimensões do molde devem incluir a expansão
f) Pneumático max. 10 bar.
g) Hidráulico DSV 12, DSV 18 máx. 40 bar, DSV 8 máx. 15 bar
h) Temperatura max. 50°C.
l) Ver capítulo pontas

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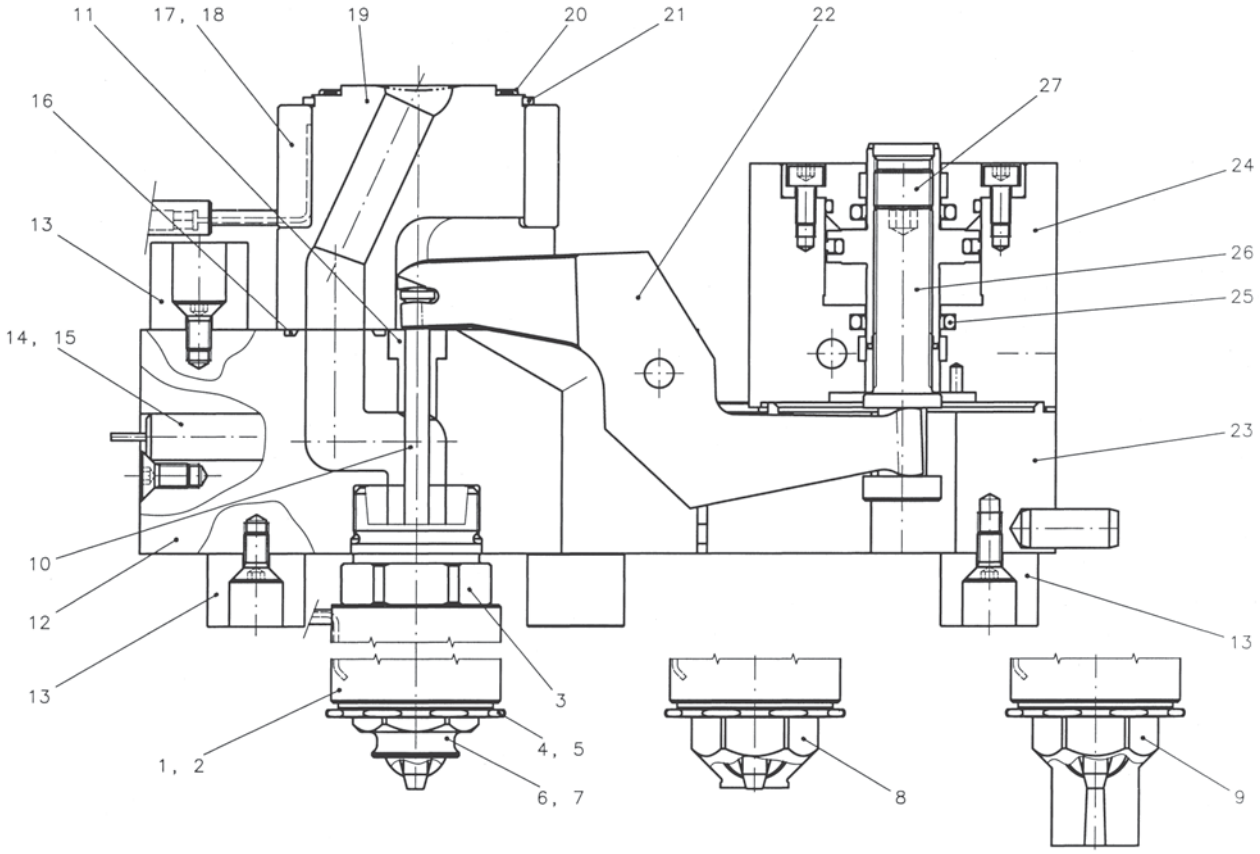
1.21 LISTA DE PEÇAS DE BUCHAS VALVULADAS



Pos.	Descrição				
1	Resistência do bico	12	Bloco manifold	21	Anel elástico da bucha entrada
2	Termopar do bico	13	Suporte		
3	Corpo frontal da bucha	14	Resistência de cartucho	22	Alavanca
4	Anel de centragem	15	Termopar	23	Suporte hidráulico/pneumático
5	Isolante	16	Anel O-Ring		
6	Diretor de fluxo	17	Resistência da bucha entrada	24	Unidade hidráulico/pneumático
7	Ponta topless				
8	Ponta standard	18	Termopar da bucha entrada	25	Jogo de vedação hidráulico/pneumático
9	Ponta com material adicional				
10	Pino válvula	19	Corpo traseiro da bucha	26	Parafuso da alavanca
11	Bucha de vedação	20	Anel isolante da bucha entrada	27	Parafuso de Travamento

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2.1 CONEXÃO ELÉTRICA

- Sistemas unitizados são pré-ligados e conferidos no padrão do cliente.

- Favor checar se os conectores são compatíveis com o controlador de temperatura.

FAVOR OBSERVAR

a) Todos os TC's são Fe-CuNi
   branco = + (magnético)
   vermelho = -
b) Confira o número das zonas de controle no desenho do sistema.
c) Consulte a INCOE® antes de trocar a configuração da resistência especificada no desenho do sistema.
d) Nunca conecte TC's em paralelo.
e) Fazer extensão de TC's somente com fios Fe-CuNi.
f) Proteja todos os cabos do calor com silicone ou fita de fibra de vidro.
g) Durante montagem do sistema proteja os cabos para não serem cortados.
h) Conexão elétrica na lateral ou no topo do molde. ‹Proteja do calor.
i) Sempre, no final faça um teste na bancada aquecendo cada zona individualmente a 100°C (212°F) e verifique se o funcionamento está correto com o número de identificação.

2.2 INÍCIO

Erros de montagem ou erros na conexão elétrica ou no início podem causar danos e custos consideráveis.

Portanto é de vosso próprio interesse prevenir estes erros. Caso haja alguma dúvida, ligue para nossa assistência técnica.

TEMPERATURA RECOMENDADA
CARACTERÍSTICAS DO CONTROLADOR

- Secagem automática da resistência todo ínicio (soft start).

- Controle contínuo da voltagem para proteger as resistências.

- Mínima voltagem de saída depois de alcancar a temperatura de trabalho para poupar as resistências.

- Adaptação automática dos parâmetros para um controle uniforme das zonas de ação rápida e lenta.

- Ajuste de uma Segunda temperatura de trabalho para reduzir ou aumentar a temperatura, em interrupções ou inícios.

- Recomenda-se o uso de controladores INCOE®.

- Utilize a temperatura correta para o material e para o molde (ver 2.4).

- Ajustar o controlador sem "soft start" a 100°C (212°F) por aprox. 10 min. e depois coloque a temperatura desejada.

- Começar a produção aprox. 5 min. depois de atingir a temperatura de trabalho e do molde.

- Quando utilizar materiais de congelamento rápido (PA 6.6) aumente a temperatura de início dos bicos, em 20°C (68°F) e reduza gradativamente.

- Caso apresente fiapos ou escorrimento, use descompressão.

- Geralmente, durante a produção as temperaturas do sistema devem ser as menores possíveis.

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2.3 INICIO DE PRODUÇÃO: SISTEMAS VALVULADOS

- Abra sempre a refrigeração dos cilíndros hidráulicos antes (tempo max. 50°C (122°F) e só depois ligue o aquecimento.
- Atenção as pressões máximas conforme instruções (ver 2.4).
- Quando a pressão hidráulica provém da máquina, limite a pressão através de válvula.
- Somente após atingir a temperatura de trabalho, verifique o funcionamento do pino válvula (de outra forma corre-se risco de danificar o "gate").
- Recomenda-se o uso do controlador sequencial INCOE® SC-12 para sistemas válvulados

PARADAS

- Reduza a temperatura do sistema em aprox. 50°C (122°F) durante paradas maiores que 10 min. para evitar a queima do material. Pode-se utilizar a Segunda temperatura previamente ajustada nos controladores INCOE®.

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2.4 TEMPERATURAS DE PROCESSO

Abreviações	Nome Comercial	T° de processo (T°p)			T°do Molde (T°m)			T°sem fluxo (T°f)	T°T –T°F	T°T –T°M
		min.	°C	max.	min.	°C	max.	°C	°C	°C
Semi-Cristalinos										
PE-HD	Vestolen	220	**240**	300	40	**50**	60	**110**	**130**	210
PE-LD	Hostalen, Lupolen	220	**220**	270	40	**50**	60	**100**	**120**	190
PP	Hostalen PP, Novolen, Vestolen P	230	**250**	300	40	**55**	70	**145**	**105**	210
PPS	Fortron, Tedur, Ryton	330	**340**	350	140	**160**	180	**260**	**70**	170
PEEK	Victrex	360	**380**	430	160	**150**	200	**320**	**60**	230
PA 12	Vestamid	250	**260**	270	70	**75**	80	**175**	**55**	170
PA 6	Nylon, Durethan B, Ultramid B, Wellamid	270	**280**	290	80	**100**	120	**205**	**45**	160
POM-Co	Hostaform, Ultraform	200	**210**	230	90	**105**	120	**165**	**45**	120
POM-H	Delrin	200	**215**	230	90	**105**	120	**175**	**40**	125
PET	Petlon, Ultradur A, Rynite	270	**285**	300	100	**110**	120	**250**	**35**	175
PBT	Pocan, Ultradur, Vestodur, Valox	260	**270**	280	60	**70**	80	**225**	**35**	195
PA 6.6	Ultramid A, Durethan A, Minlon, Zytel	280	**290**	300	80	**100**	120	**255**	**30**	195
Amorfos										
PSU	Ultrason S	350	**355**	360	140	**150**	160	**240**	**115**	205
PES	Ultrason E	340	**350**	360	140	**150**	160	**240**	**110**	200
SAN	Luran, Lustran	240	**250**	260	60	**70**	80	**140**	**110**	200
PPE (PPO)	Noryl, Luranyl, Vestoran	280	**300**	310	80	**100**	120	**195**	**105**	210
PS	Vestyron, Polystyrol	220	**240**	280	30	**45**	60	**130**	**100**	190
SB	Styrolux	220	**240**	280	40	**60**	80	**130**	**100**	180
ABS	Novodur, Terluran, Cycolac, Lustropak	240	**260**	280	50	**65**	80	**150**	**100**	190
PMMA	Plexiglas, Degalan, Lucryl, Resart	240	**265**	290	50	**70**	90	**130**	**100**	170
PC	Makrolon, Lexan	290	**305**	320	90	**110**	120	**210**	**90**	200
PEI	Ultem	360	**380**	420	150	**160**	180	**290**	**80**	230
Blendas										
PC - ABS	Bayblend, Terblend, Cycolac, Cycoloy	260	**275**	280	70	**85**	100	**180**	**95**	190
PC - PBT	Makroblend, Xenoy, Ultrablend	260	**275**	280	60	**70**	80	**220**	**55**	205
Elastômeros										
PP - EPDM	Vestopren, Levaflex XP, Santoprene	210	**220**	230	40	**50**	60	**165**	**55**	170
SEBS	Thermoflex, Thermolast K, Evoprene	220	**225**	240	30	**35**	40	**180**	**45**	190
TPE-E	Hytrel, Lomod	200	**240**	260	20	**40**	65	**200**	**40**	200
PUR	Desmopan, Elastolan, Caprolan	200	**215**	230	30	**25**	40	**180**	**35**	190

Estas temperaturas são para materiais standard. Dependendo da apliacação e do material, podem ocorrer variações.

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3.1 SOLUCOES DE PROBLEMAS DE BUCHAS

CONGELAMENTO DO PONTO DE INJEÇÃO (VER 1.3, 2.2, 2.3, 2.4)

- Verifique as temperaturas do molde e do processo.
- "Gate" Ponta muito curta (desgaste, ou danificada).
- Ponto de injeção muito pequeno.
- Contato demasiado da ponteira com o molde.
- Ponteira com muito sobremetal.
- O topo da ponteira em contato com o molde.
- Dimensões do alojamento do molde fora de especificação.
- Particulas estranhas no ponto de injeção.
- A umidade do material expulsa o material pelo ponto de injeção e este se congela.
- Ciclo de injeção muito grande ou irregular.

QUEBRA DA PONTEIRA (VER 1.3)

- Frente da ponteira em contato com o molde.

CONGELAMENTO NA CABEÇA DAS BUCHAS (VER 1.2)

- Defeitos na resistência ou no termopar da cabeça.
- Resistência da cabeça em contato com o anel de centragem ou com o molde.
- Falta de anel isolante na cabeça.
- Anel centrador com diâmetro muito pequeno (contato muito grande).

VAZAMENTOS PELA PONTEIRA (VER 1.2, 1.3)

- Diâmetro danificado.
- Dimensões do alojamento do molde fora de especificação.
- Diâmetro da ponteira danificado devido à falta do anel centrador

TRINCAS NA CABEÇA DE BUCHAS (VER 1.2)

- Profundidade do raio errada ou muito profundo.
- Bico da Máquina fora de centro.
- Força de fechamento muito alta e muito rápida.

PROBLEMAS PARA A BUCHA ALCANCAR A TEMPERATURA DE PROCESSO OU NÃO A ATINGE.

- termopar defeituoso ou danificado.
- Resistência ou o corpo da bucha em contato com o molde.
- Vazamento no fechamento do ponto de injeção.
- Resistência danificada ou defeituosa.

ESCORRIMENTOS GOTEJAMENTO OU FIAPOS NO PONTO DE INJEÇÃO (VER 1.3, 2.2)

- Temperatura muito alta.
- "Gate" muito grande.
- Molde muito Quente para o tempo de ciclo.
- Falta de descompressão.
- Pouco contato da ponteira ("gate" muito quente).
- Para pontas CT ou SF-CT, trocar para ST ou SF-ST.

FRENTE DA PONTEIRA COM DEFORMAÇÃO.

- Pouca refrigeração do molde.
- Pouco contato da ponta.
- Verificar possibilidade do uso de uma ponta.

VESTÍGIO MUITO ALTO (ST/CT)

- Comprimento normal do ST/STT aprox. 50% do diâmetro do ponto de injeção.
- Comprimento normal do CT/CTT aprox. 100% do diâmetro do ponto de injeção.
- Ponta muito curta (desgaste, ou danificada).
- XS sobremetal não removido até o comprimento A/L no centro.
- Detalhe do ponto de Injeção fora de especificação.
- Alojamento do molde fora de especificação.

MARCAS DE CALOR NO PRODUTO INJETADO (VER 2.4)

- Temperatura do sistema muito alta.
- Tempo de resistência no Sistema muito longo (paradas).
- Excesso material reciclado.
- Checar se não é causado pela máquina.
- Se o material é sensível a tensões (retardante de chama) use ponta SF-CT ou CT.
- Pontos mortos no sistema verifique os canais, (chame o serviço INCOE®).

DIFERENÇAS DE COR NA PEÇA INJETADA.

- Material sensível à temperatura ou mal misturado.
- Master mal misturado.
- Cor anterior ainda na máquina.
- Pontos mortos no sistema verifique os canais, (chame o serviço INCOE®).

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3.1 SOLUCOES DE PROBLEMAS DE BUCHAS (CONTINUAÇÃO)

- Cor antiga no sistema. Siga estes passos para remover a cor antiga:
  1. Feche a refrigeração do molde no lado da injeção.
  2. Aumente a temperatura do sistema da câmara quente em aprox. 20°C (68°F) (acima da temperatura de processo) e aguarde 10 minutos (somente 5 minutos para POM).
  3. Afaste a unidade de injeção. Aumente a temperatura das resistências da unidade de injeção em aprox. 30°C (86°F).
  4. Após atingir a temperatura, limpe a unidade de injeção. Cuidado com as peças quentes.
  5. Limpe o bico de encosto entre a maquina e a entrada de material do sistema de câmara quente.
  6. Injete aprox. de 3 a 4 ciclos, com velocidade reduzida. Para pesos de ciclo reduzidos, injete o material plásticos com o molde aberto. Não deve haver marcas da cor anterior visíveis.
  7. Para sistemas valvulados, mova a agulha de 2 a 3 vezes durante este processo (Abre-fecha), sem Injetar material.
  8. Abra a refrigeração do molde e reajuste as temperaturas normais do sistema (câmara quente e unidade de Injeção).
  9. Aguarde 10 minutos (somente 5 para POM).
  10. Reinicie a produção.

3.2 SOLUCOES DE PROBLEMAS DE BUCHAS E MANIFOLDS

VAZAMENTO ENTRE BUCHAS E MANIFOLDS OU NAS PONTAS

- Ver 1.11, 1.12.

CONGELAMENTO DA BUCHA DE ENTRADA (VER 2.4)

- Defeitos na Resistência ou no termopar.
- Muito contato do anel de centragem do molde.

VARIAÇÕES DE TEMPERATURA DO PROCESSO (VER 2.2)

- Calibração do controlado.
- Caso esteja sincronizado com o ciclo. de injeção o contato do sistema não é constante (placa extratora).
- Termopar defeituoso ou danificado.

ROSCAS ENGRIPADAS

- Aquecer (chame serviço INCOE®).
- Use sempre graxa anti-engripamento nas roscas.

3.3 SOLUCOES DE PROBLEMAS DE SISTEMAS VALVULADOS

MATERIAL DEGRADADO NOS CANAIS

- Limpar com banho (ligue para o serviço INCOE®).

PINO VÁLVULA NÃO SE MOVE

- Operação necessária.
- Temperatura não adequada.
- Verifique o estado das vedações.
- Verifique as resistências do bico e do manifold.

PONTO DE INJEÇÃO PRESO

- Reduza Temperatura.
- Alojamento do ponto de Injeção fora de especificação.
- Refrigeração inadequada para o tempo de ciclo desejado

VÁLVULA COM MAU FECHAMENTO

- Eleve a temperatura.
- Feche antes.
- vedações dos cilindros defeituosas ou danificadas.
- Verificar o ajuste do pino.

A CONTRAPORCA DO CILINDRO SE AFROUXA

- Superficie de contato suja (chame o serviço INCOE®).
- Use a chave especial INCOE®.

VAZAMENTO PELO PINO

Tipo Ajustável

- Reajuste a vedação ajustável aquecida, o pino deve mover-se com a mão.

Tipo Não ajustável

- Diâmetro de vedação fora de especificação devido a desgaste – substituir.

VAZAMENTO DE ÓLEO

- Vedações do cilindro danificadas por temperatura muito alta ou por muita pressão.

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4.1 TERMOS GERAIS E CONDIÇÕES DE VENDA

1 Applicable Law and Jurisdiction

These general terms and conditions apply to all proposals and quotations submitted by Seller, to all purchase orders received by Seller, and to all goods and services sold by Seller, except as other-wise specifically provided in a document signed by Seller. This sale or any sale resulting herefrom consists only of these terms and conditions and those in other documents which are referred to herein or are attached hereto or in a document subsequently signed by Seller and referencing this transaction (all of which constitute the "Agreement"). THE AGREEMENT SHALL BE GOVERNED, CONSTRUED AND ENFORCED UNDER THE LAW OF THE STATE OF MICHIGAN INCLUDING THE UNIFORM COMMERCIAL CODE IN FORCE ON THE INITIAL DATE OF THE AGREEMENT ("UCC"), EXCEPT AS PROVIDED HEREIN. The U.N. Convention on the International Sales of Goods shall not apply. Any services to be provided hereunder, whether or not they are otherwise ancillary to and part of a sale of goods (as separate units), shall be considered ancillary to a sale of goods and the UCC shall apply to all goods and services to be provided hereunder ("Goods"). **THE COURTS OF MICHIGAN SHALL HAVE EXCLUSIVE JURISDICTION OVER THE PARTIES AND THE CLAIMS ARISING UNDER OR RELATED TO THE AGREEMENT.** The parties stipulate to the convenience of Michigan courts in general, and Oakland Circuit Court in particular, as to all litigation. Any declaration of unenforceability of a provision shall be as narrow as possible and shall not affect the enforceability of the other provisions.

2 Formation, Integration and Modification

A. The Agreement supersedes all previous quotations and agreements pertaining to the Goods. Delivery to Seller of the Buyer's acceptance of a Seller's quotation (according to its terms), Seller's actions in reliance on Buyer's oral acceptance of a written or oral quotation, or Buyer's receipt of the Goods, will constitute a binding contract under the terms of the Agreement. The Agreement is subject to Seller's revocation or cancellation without liability until it is approved by Seller at its home office. Notice of such approval may be furnished to the Buyer in the form of an acknowledgment, shipment, or other form of express approval.

B. An order submitted by Buyer orally or in a purchase order or other writing (whether or not it contains terms or conditions modifying, adding to, repugnant to, or inconsistent with these Terms and Conditions), may be accepted, approved or filled by Seller, but any resulting contract and the liabilities or obligations of Seller shall be determined solely by the Agreement, and (unless the Seller otherwise advises Buyer in writing) notice is hereby given that Seller objects to any such terms or conditions in Buyer's purchase order or other writing. Seller shall not be deemed to have in any way enlarged or modified its liabilities or obligations under the Agreement by filling such order or by failing to further object to Buyer's terms or conditions.

C. The Agreement is a final, complete and exclusive statement of the Agreement of the parties. THE SELLER IS WILLING TO NEGOTIATE WRITTEN CHANGES TO THESE TERMS AND CONDITIONS, BUT RESERVES THE RIGHT TO MAKE AN ADJUSTMENT IN THE PRICE OF THE GOODS. No modifications, limitations, waivers or discharge of the Agreement or any of its terms shall bind Seller unless in writing and signed by Seller's authorized employee at its home office. Notwithstanding anything to the contrary in this Agreement, no modifications, limitation, waiver or discharge of any provision of the Agreement shall affect the Buyer's liabilities to Seller accrued prior thereto. Seller may correct unilaterally any mathematical and typographical errors in the Agreement. Typed provisions of the Agreement take precedence over printed provisions. A course of performance, course of dealing, or customs in the trade shall not constitute a modification or waiver by Seller of any right by Seller.

D. The Agreement is only for the benefit of the parties, except all disclaimers and limitations applicable to Seller shall be for the benefit of Seller's agents, employees, contractors, and suppliers. If any provisions are determined to apply to third parties, all other provisions including limitations, waivers, and disclaimers shall also apply.

3 Prices, Payment and Risk of Loss

A. Prices contained in Seller's published price lists, if any, are subject to change without notice. Prices contained in individual written quotations or proposals are firm only for a period of thirty (30) days from the date of the quotation after which Buyer should inquire of Seller as to their validity and request a written confirmation or revision. Prices do not include taxes and Buyer shall pay all applicable sales or other taxes levied with respect to Goods (and replacements) and the Agreement, unless exempt therefrom. All prices are in United States dollars. Buyer shall pay all government fees levied on the installation and inspection of the Goods. Buyer shall pay upon receipt all invoices rendered by Seller for any such items Seller may pay and for the Goods.

B. This Agreement is for a shipment contract and the Goods shall be delivered F.O.B. Seller's dock. Whether or not Seller prepays shipping charges, risk of loss passes to Buyer upon tender of the Goods to a carrier. Seller's breach of the Agreement shall not affect the passing of the risk of loss to Buyer notwithstanding any provision of law to the contrary.

C. Seller may unilaterally increase prices to cover increased costs (plus reasonable overhead and profit) of design, materials, and manufacturing required by changes requested by Buyer after the date of any quotation.

D. All amounts not paid to Seller when due shall incur a carrying charge of 1.5% per month to the extent allowed by law and otherwise at the highest written contract rate allowed by law.

E. All amounts due on installation or other event which requires the action or cooperation of Buyer which Buyer fails to supply timely shall become due upon such failure.

4 Delivery

Shipping dates are estimates based on Seller's present engineering and manufacturing capacity and scheduling, and may be revised by Seller upon receipt or scheduling of Buyer's order. All shipping dates are approximate and shall be computed from the date of entry of the order on Seller's books. All shipping dates are further subject to Seller's prompt receipt from Buyer of a written purchase order or acceptance, letter of credit, down payment, and other conditions as specified in the Agreement, and of all drawings, information and approvals necessary to provide Goods and to grant any credit proposed in the Agreement.

5 Delay of Shipment or Performance Excused for Various Reasons

A. If shipment of any item or other performance by Seller is delayed at the request of or due to the fault of Buyer, Seller may at its option hold the item at the place of manufacture at the risk and expense of the Buyer from the time it is ready for shipment. In the event of any such delay in shipment, full and final payment for an item shall be due and payable thirty (30) days after the Buyer is notified that the item is ready for shipment. If the Seller is unwilling to accommodate the Buyer by holding such item, the Buyer shall accept shipment immediately.

B. Dates for Seller's performance are estimates only. In addition, the Seller shall not be in default because of its delay or failure to deliver or perform resulting, in whole or in part, from: (i) any foreign or domestic embargoes, seizures, acts of God, insurrections, war, or the adoption or enactment of any law, ordinance, regulation, ruling or order, or (ii) the lack of usual means or transportation, fires, floods, explosions, strikes or any other accidents, contingencies, or events, at the Seller's or its supplier's plant or elsewhere (whether or not beyond the Seller's control) which directly or indirectly interfere with, or render substantially more burdensome, Seller's production, delivery, or performance.

6 Inspection, Testing and Rejection

A. If the Agreement expressly provides for Buyer's inspection and/or acceptance of the Goods, Seller's standard test procedures conducted by Seller's representative shall be the criteria for inspection and/or acceptance, unless other specific procedures have been specified in the Agreement.

B. All drawings, specifications, technical documentation, samples, prototypes and Goods shall be deemed approved and/or accepted by Buyer if Buyer does not provide a written objection and/or rejection within seven (7) days of receipt or other reasonable time established by Seller. Any objection and/or rejection by the Buyer must be in writing and state with specificity all defects and non-conformities upon which Buyer will rely to support its rejection. ALL DEFECTS AND NON-CONFORMITIES WHICH ARE NOT SO SPECIFIED ARE WAIVED.

7 Installation and Start Up

All Goods shall be assembled and installed by and at the expense of the Buyer. Seller may furnish, upon request and without additional cost or liability to Seller, written instructions for installing, maintaining, and operating the Goods. At Buyer's request and cost, Seller may furnish personnel and equipment to assist in the installation and/or start up of the Goods. Buyer shall pay Seller its prevailing per diem rates for such personnel and equipment plus reasonable transportation, food, lodging and other travel expenses. Buyer shall have competent supervisory, maintenance and operating personnel present when Seller's personnel are performing such services.

8 Software License

The Seller grants the Buyer, for its internal use only, a non-exclusive perpetual license ("License") of all user manuals, software programs, firmware, and storage media ("Software") provided by the Seller in conjunction with the Goods with which the Software is provided, for the sole purpose of the operation of the Goods. This License terminates automatically if Buyer is in default of its obligations. The Software may be provided in machine readable object code only. Licensee may make and keep one copy of the object code, if provided by Seller, for backup purposes. When making a copy, the Buyer shall reproduce all Seller's copyright or patent notices in all forms originally included in the Software. Buyer shall not make any effort to obtain or reproduce the Software's source code. Title and all ownership rights to the Software remain with Seller, its licensors, or its suppliers. The Software is the proprietary information and trade secret of the Seller or its licensors, whether or not any portion thereof is or may be validly copyrighted or patented. The License may not be assigned nor transferred by Buyer except as a part of a transfer of the Goods with-out the written consent of Seller which may be withheld. The Software is provided for the Buyer's internal use only and the Buyer shall maintain the confidential nature of the Software and related materials and protect them against disclosure or improper use. Buyer shall pay all taxes based on the Software or use of the Software, however designated or levied, except those based on Seller's net income. All disclaimers and limitations applicable to the Goods apply to the License.

9 General Express Warranties

A. Seller warrants to Buyer only, that Goods (or portions thereof manufactured by Seller) shall be free from manufacturing defects in materials and workmanship which are discovered within the warranty period, subject to the disclaimers and limitations of the Agreement. This is not a warranty of performance, but a limited warranty as to the condition of the Goods at the beginning of the warranty period. The warranty period, measured from date of shipment by Seller, shall be: one year for hot runner systems and components (other than heaters and thermocouples); three years for defects causing leakage for DFQ bushings; three years for cast (pro-rated) and DF heaters; one year pro-rated for screen pacs, fast cycle bushings, and KX heaters; six months for thermocouples; two years for temperature and valve gate controllers (reduced to six months for electronic components); one year for quick mold change products; and 90 days for all other Goods. The percentage of the replacement cost shall be reduced by three percent for each full month from 90 days after the date of shipment for the cast heater warranty and by 50% and 75% at the end of six and nine months, respectively, after shipment for the screen pac, fast cycle bushings, and KX heater warranty. Because the Goods may be subject to a wide variety of use, installation, maintenance and cleaning, the warranty is only against such defects and not against any other failures such as, but not limited to, those due to wear and tear, and normal maintenance and perishable items are excluded from this warranty against defects.

B. Seller warrants to Buyer that the Goods will be as described in the Agreement in all material respects, subject to the limitations stated herein and Seller's published and internal standards; however, Seller retains the right to change the dimensions, composition, design, performance, color and appearance of the Goods without liability if, in its judgment, the change is non material. Seller may, in its discretion, also rely on any generally accepted industry standards.

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C. Seller's warranties shall apply only if the Goods: (i) have been installed, maintained, and used in conformity with instructions furnished by Seller from time to time, if any; (ii) have been subjected to normal use for the purpose for which Goods were designed;

(iii) have not been subjected to misuse, negligence, or accident; and, (iv) have not been altered or repaired by persons other than Seller in any respect which, in the judgment of Seller, adversely affects the condition or operation of the Goods.

10 Patent Express Warranties

Seller shall defend and indemnify Buyer from any claim which asserts that the Goods or their inherent methods of operation, intrinsically, infringe any United States patent, except as to a claim based on Buyer's use of the Goods as a step in an overall process or as an element in an overall combination. Seller's obligation shall not apply to a claim based on Goods or portions thereof specified, designed, or manufactured by Buyer. Buyer shall notify Seller promptly of any assertions of patent infringement and provide Seller with assistance and information requested by Seller, or Seller shall have no further obligation to defend or indemnify. Seller shall defend with its counsel or other counsel of its choice and shall have the sole right, without consultation with Buyer, to take all action Seller deems appropriate to prosecute or settle such claims. Seller's exclusive obligation to indemnify as to Goods declared to infringe is limited to the acquisition of a license, the replacement of Goods with non-infringing goods, the modification of the Goods so that they are non-infringing, or the return of the purchase price and shipping costs in exchange for the Goods, as Seller may elect. This section states the Seller's entire and exclusive obligation regarding patent infringement.

11 Disclaimer and Limitation of Express Warranties

There are no express warranties other than those contained in the Agreement. Any representations as to performance and other matters, except as contained in the Agreement, were for illustrative purposes only and do not constitute a warranty. Whether or not the Goods are to be used exclusively by Buyer, there shall be no third party beneficiaries to the express warranties contained herein. Seller does not warrant any portion of the Goods not manufactured by or not furnished by Seller (whether or not specified by Buyer), but Seller shall assign to Buyer upon request all assignable warranties of Seller's suppliers related to such Goods. All descriptions, shipping specifications and illustrations of the Goods or the Seller and its quality and other systems and capabilities in catalogues, brochures and price lists or otherwise provided by the Seller are intended for general guidance only and the Seller is not responsible for any errors or omissions therein or for any loss or damage resulting from reliance on them. Seller does not warrant that it or the Goods are in compliance with any entity, organization or industry standards, guidelines, or procedures unless specifically contained in the Agreement.

12 Remedy and Limitation of Seller's Liability

A. Defective or non-conforming Goods discovered and returned during the warranty period shall be repaired, or replaced by Seller without any additional charge and shipped to Buyer, FOB Seller's plant, for reinstallation by Buyer at its cost, subject to the terms hereof. The warranty obligation of Seller is limited to the repair or replacement at Seller's plant of any part of the Goods which Buyer shall, within the warranty period, return to Seller, with transportation charges prepaid by Buyer, and which Seller shall determine upon examination to be defective or not in conformity with the express warranties contained herein. In lieu of repair or replacement, if Seller elects, Seller may, upon return of such Goods and making a determination of non conformity or defect, keep the Goods and refund the purchase price. Buyer's remedies shall be limited **(even in the event of Seller's default of its warranty obligations)** exclusively to those provided in this section. **UNDER NO CIRCUMSTANCES SHALL SELLER BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES.** Buyer waives any causes of action or theories of liability including, but not limited to, those arising under contract, tort, strict liability, product liability, statutes, or otherwise, except as specifically provided by the UCC as modified and limited herein. The replacement or repair of Goods by the Seller does not give rise to any new warranty except the warranty period provided for herein shall be extended by the length of any period from the date the defective or non conforming Goods are received by the Seller until the date repaired or replacement Goods are delivered to Buyer.

B. Buyer must contact Seller requesting warranty coverage plus a return authorization number and other instructions for the return of Goods to Seller or other instructions. If requested by Seller, Buyer shall issue a new purchase order or amendment to Seller for replacement parts, subject to Seller issuing a credit memo if Buyer's claim for warranty coverage is approved. Buyer must comply with Seller's return instructions (including return of the Goods) within 30 days or the claim shall be deemed conclusively to have been abandoned. Buyer is responsible for properly tagging, identifying, and packing returned Goods. Goods returned without compliance with the above procedures shall be returned to the sender at sender's cost.

13 Disclaimer of Implied Warranties

THE SELLER DISCLAIMS ALL IMPLIED WARRANTIES (OTHER THAN GOOD TITLE) INCLUDING BUT NOT LIMITED TO THOSE OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, AND NON-INFRINGEMENT. Seller does not warrant the Goods will comply with the requirements of any safety or environmental code or regulation of any federal, state, municipality or other jurisdiction beyond the specific express warranties in this Agreement.

14 Parts, Service and Training Performed by Seller

All warranty and non-warranty parts, inspection, labor, service, software, and training, if any, provided by the Seller or its agents and contractors (including those provided under purchase orders subsequent to the Agreement) related to the Goods are subject to all limitations and disclaimers of warranties and remedies provided in the Agreement. The Seller may have access to the Goods during or after installation of the Goods. The Seller is not under any duty to inspect the Goods for any defects or any improper use or modification of the Goods nor to correct or advise the Buyer of any such condition, use or modification, which is observed. Any notification which may be given is voluntary and subject to all limitations and disclaimers in the Agreement.

15 User's Responsibility for Safety

It is Buyer's or other user's responsibility to provide all proper dies, devices, tools, training, and other means that may be necessary to effectively protect all personnel from serious bodily injury which otherwise may result from the method of particular installation, use, operation, or service of the Goods. Manuals furnished by Seller; ANSI Safety Standards; EPA, OSHA and similar state regulations; and other sources should be used by Buyer to insure the safe use of the Goods. If Buyer fails to comply with the obligations set forth in this section, Buyer shall indemnify and save Seller harmless from any liability or obligation incurred by Seller to persons injured directly or indirectly in connection with the operation of the Goods and all warranties of Seller shall become automatically void.

16 Indemnification

Buyer shall indemnify the Seller from any and all third party claims, damages, and expenses (including reasonable attorney fees) under theories of tort, product liability, negligence (ordinary or gross), warranty, contract, statute, or otherwise arising out of the use, storage, sale, processing or other disposition of the Goods, supplies or materials used in connection with the Goods, or parts manufactured with the Goods, if the action or inaction of the Buyer or its employees, customers or agents, or the Buyer's design specifications, were a material or proximate cause of injuries or damages giving rise to claims against the Seller.

17 Consequential, Incidental, and Other Damages

BUYER AND THIRD PARTIES SHALL NOT BE ENTITLED TO ANY CONSEQUENTIAL, PUNITIVE, EXEMPLARY, OR INCIDENTAL DAMAGES, AS DEFINED IN THE UCC OR OTHERWISE. **This limitation shall be enforced regardless of whether Seller has defaulted in its warranty or other obligations.** Any legal inability to limit or restrict the right of the Buyer or a third party to such damages shall not affect the right of Seller to indemnification hereunder, and under no circumstance shall Buyer recover more than the purchase price.

18 Security Interest, Power of Attorney

In addition to any security interest granted by the UCC, the Buyer hereby grants a security interest to the Seller in all Goods and documents related thereto and proceeds and products therefrom to secure all obligations of the Buyer to the Seller, whether or not arising under the Agreement. Buyer shall sign financing statements evidencing the security interest as reasonably requested by Seller, or Seller may file a copy of the Agreement or portion thereof as a financing statement. Buyer grants Seller an irrevocable power of attorney to sign Buyer's name to a financing statement if necessary or convenient to perfect Seller's security interest. In case of a default by Buyer, Seller may peaceably enter the premises of the Buyer and others to repossess or render inoperable all Goods in which it has a security interest.

19 Proprietary Information

A. Buyer acknowledges that any information disclosed to Seller has not and will not be confidential or a trade secret unless clearly and conspicuously noted on the disclosure, or in some other writing delivered to Seller at or prior to the time of the disclosure. Otherwise, Seller shall be under no obligation to refrain from using in its business any information, manufacturing processes or unpatented disclosures which may pass to it from Buyer in the performance of the Agreement

B. All proposals, plans and other information furnished by the Seller in bidding, negotiating and performing the Agreement, are confidential and the property of Seller and shall not be shown or disclosed to any other bidder, and shall not be shown or disclosed to any third party or used by Buyer except as may be necessary for the selection or use of the Goods.

C. Any invention or other information developed by Seller in the performance of the Agreement shall remain the property of Seller.

20 United States Government Regulations

The Buyer shall not engage in any transaction with respect to the Goods which violates any statute or regulation of the United States of America.

21 Certifications

Seller certifies that any Goods produced in the United States shall be produced in compliance with all applicable requirements of Sections 6, 7 and 12 of the U.S. Fair Labor Standards Act, and of the regulations and orders of the U.S. Department of Labor issued under Section 14 thereof. No other certifications or waivers regarding payments to Seller's suppliers or laborers are required.

22 Time for Bringing Action

Any proceeding by the Buyer for breach of the Agreement or any other right against Seller arising from or in connection with the payment cannot be filed nor maintained unless: (i) it is commenced within one (1) year after the cause for action has accrued; (ii) Buyer has given timely written notice to Seller of its claim as provided herein; and (iii) Buyer deposits the unpaid portion of the purchase price with the tribunal pending final adjudication. An action shall accrue no later than shipment of the Goods.

#330439 (2/21/01)

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5.1 CONTATOS GLOBAIS DE SERVIÇO

Em caso de problemas ou para maiores informações, favor utilizar a informação de contato abaixo, ou visite www.incoe.com

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Estes produtos são cobertos por uma ou mais das seguintes patentes: USA 5,269,677; 5,660,369; Canada 2,062,903; Germany 4028660; 4324275; Japan 2,093,613; e outra patentes internacionais pendentes.

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rev. 02/11 item #150529P

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